RAILROAD GAZETTE

FRIDAY, JULY 3, 1896.

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Contributions.

Killing Weeds and Grass.

Minneapolis, St. Paul & Sault Ste. Marie Railway Co., MINNEAPOLIS, Minn., June 26, 1896.

TO THE EDITOR OF THE RAILROAD GAZETTE:

I notice in your issue of June 5, on page 387, inquiries made in regard to weed killing.

For the benefit of those making inquiry, permit me to state that our company are using a weed burner, which we made ourselves, and it works very satisfactorily. The weeds are burned by the use of crude oil and air. The apparatus is on a flat car which propels itself, thereby saving the expense of a locomotive. It is only intended to be used on branch lines where the trains are few. The machine uses from 15 to 20 gals. of oil per mile, and burns 10 miles per day. There is no patent on this, and any one can make them, if they so desire. It is at present in use on the line between Hankinson and Kulm, N. Dak., where it can be seen at any time.

E. PENNINGTON,
Superintendent.

Missouri, Kansas & Texas Railway Co., ST. LOUIS, Mo., June 12, 1896.

TO THE EDITOR OF THE RAILROAD GAZETTE:

I have been in the Southwest for the past 10 days and have made inquiries among railroaders both on our own line and connecting lines, but I could get in this locality no definite information on the subject of killing weeds. I heard some indefinite rumors about some kind of a salt being sprinkled on the weeds, which, carried down by the next rain, would have the effect of killing them, and also some rumors about the magical effect of electricity, but I found out nothing definite. Some years ago, in the Northwest, there was a cooking arrangement used on the "Soo." It was said that if it should go very slowly over the road, about two miles an hour, and run over every few days, it would keep the weeds under control. But I understand that the weeds there are pulled out of the track just as they are in Texas, by main strength and awkwardness. The main work of our section men in Texas, during the summer, is weed killing. If any better or more economical method of killing weeds could be evolved we would very much like to know of it.

S. B. FISHER,
Chief Engineer.

Americanization of English Rolling Stock.

LONDON, June 13, 1896.

TO THE EDITOR OF THE RAILROAD GAZETTE:

Steadily and of late by no means slowly our passenger rolling stock is being Americanized. A week or two back the Great Western, which has the longest mileage of any line in this country, introduced its first dining-car, this time on the route between London and South Wales. Dining-cars to the West of England are to follow in a few weeks. The Great Northern has just completed a pair of first and third-class dining-saloons for the London-Leeds service, each mounted on six-wheeled bogie trucks and connected by Gould vestibules and automatic couplers. The first-class car is about 62 ft. and the third class nearly 66 ft. in length with a width of 9 ft. and a height of 13 ft. 4¼ in.—dimensions which would have been thought quite impossible here only a very few years back.

The North Eastern has just brought out a new train for its local service which is mounted on bogie trucks through out, and it is understood that this company will in future build bogie stock only for its ordinary work. Jointly with the Great Northern and the North British the same company is responsible for two new trains for the East Coast service to Scotland which will apparently be more like the great American trains than anything we have hitherto seen in England. Eight coaches, each on twelve wheels, with a total length of 530 ft., with Gould vestibules and automatic couplers throughout, will have a total weight of about 270 tons and seating accommodation for 300 passengers. The bulk of the train will be on the compartment system with corridors at the side, but one third-class carriage will be somewhat of the nature of an American day car, for it will be divided only into three sections, seating respectively 23, 16 and 15 passengers, and the passage will be right down the center. Attendants on the train will supply, tea, coffee and other light refreshments. It should be added that this train, as also the North Eastern train last mentioned, is to be fitted with the "quick acting" Westinghouse brake, here adopted for the first time in actual working in England.

Our locomotives, too, are becoming Americanized to some extent. Not only are the drivers agitating for larger and better "cabs," but also both the North Eastern and the Caledonian have brought out express engines of a size hitherto unknown. The Caledonian engines are distinguished more especially by their great steam-producing capacity, and have over 1,400 ft. of heating surface. The most remarkable feature in the North Eastern engines is that they have four-coupled driving wheels with the exceptional diameter of 7 ft. 7¼ in.

W. M. ACWORTH.

A Record Run from London to Paris.

BY J. PEARSON PATTINSON.

The details which follow illustrate a remarkably fine record run by the London, Chatham & Dover Railway of England and the Northern Railway of France. The time usually taken between London and Paris by the fast express trains of these companies is about 7½ hours, but, on this occasion, having to convey a special party to Paris for the Grand Prix, an attempt to reduce this time by about an hour was made and was brilliantly successful. Before giving the actual detailed timing, we present a summary of it below, followed by notes on the gradients met with en route:

(*a.*) *Summary:*

Miles.	Stations.	Time all'w'd p. m.	Time actual. H. M. Sec.	Losses by signal delays. M. Sec.	Net time. M. S.	Speed in miles per hr.
	Victoria, dep ..	12:50	12 51 22			
78½	Dover Pier, arr.	2:20	2 13 15	.....	81 56	57.5
	" dep	.....	2 17 0			
25	Calais (Maritime), arr	.....	3 33 0	.....	76 0	Boat.
	Calais (Maritime), dep. ..	3:50	3 48 8			
102½	Amiens, arr	5:49	5 38 11	6 15	103 48	59.2
	" dep	5:51	5 51 21			
81¼	Paris (Nord), arr	7:30	7 22 12	9 45	81 6	60.1

The speed, it will be seen, works out at quite a high figure after deducting signal checks, which have been carefully estimated as regards the loss of time occasioned by them. The Northern of France was unfortunate in not getting a clear road and in having a special stop at Creil. Had the train got a clear headway and had the long wait of over 13 minutes at Amiens been shortened the arrival in Paris might easily have been 7 p. m. or a little earlier.

The return journey was scheduled at the same rate, but the writer only traveled from Dover to London, and particulars of this are given below.

(b.) *Gradients.*—Of the two lines, the Chatham is much the harder. Starting with a stiff half mile of 1 in 61, it rises gradually almost to Herne Hill. whence to Sydenham Hill the rise is 1 in 100. A short descent, similarly steep, succeeds, to be followed after undulations by a severe but short piece, rising at 1 in 95 between Bromley and Bickley. The line continues to ascend steeply with breaks of down grade at one or two points, to Farningham, whence to Sole street is nearly all 1 in 100 up. A descent of 6 miles, mostly at 1 in 100 or 1 in 132, brings us to the sharp curves of Strood and Rochester, over which speed is reduced. From Chatham to New Brompton is 1 in 132 rising, and then the line is nearly level all the way to Faversham, after which is a steep ascent at 1 in 100 to 1 in 110 to the tunnel beyond Selling, followed by a drop of almost the same length at 1 in 132 into Canterbury. From this point as far as Shepherd's Well there is an almost continuous rise, varying from 1 in 105 to 1 in 132, the latter grade predominating. A descent at similar steep grades brings us to Dover. Without doubt the route is a very severe one.

The French line is much easier, although soon after leaving Calais a difficult bank eight miles in length, rising at 1 in 125, is encountered. A descent of about six miles at the same grade leads to an undulating stretch extending to Etaples, some of the short ascents being at 1 in 140. After Etaples the line is almost level to Amiens, whence to Gannes, 27 miles away, it ascends at easy grades of 1 in 250 to 1 in 330, followed by an almost equally long descent to Creil on similar grades. Soon after Creil a long bank, nearly all 1 in 200, is met with. This extends to Survilliers, 13 miles, and thence to St. Denis the gradient is a descending one at about the same rate. The Nord route is therefore a section of moderate difficulty, and not nearly so hard as the L., C. & D. section from London to Dover.

(c.) *Detailed Timing.*—This, with particulars of passing times for each station en route, distances, etc., is now given. [Mr. Pattinson sends a detailed table of times on the return from Dover Pier to Victoria Station. This we do not print, as it varies little from the journey down. The total time was but 37 seconds greater.—EDITOR.]

FRIDAY, JUNE 12, 1896.

VICTORIA TO DOVER PIER (LONDON, CHATHAM & DOVER RY.)

Engine 16 (4-coupled, bogie, cylinders 18½ by 26 and 6 ft. 6-in. drivers), and 6 coaches (about 75 tons).

Stations.	Actual time. p. m. H. M. S.	Distance. Miles. Chs.
Victoria.....dep.	12 51 22	
Grosvenor Road	12 52 33	0 58
Battersea.....	12 53 18	.. ..
Wandsworth.....	12 54 8	1 78
Clapham.....	12 54 38	2 30
Brixton	12 55 41	3 21
Herne Hill.....	12 56 32	3 78
Dulwich.....	12 57 51	5 0
Sydenham Hill.....	12 58 46	5 58
Penge.....	1 0 30	7 15
Kent House.....	1 1 11	7 65
Beckenham.....	1 1 57	8 54
Shortlands.....	1 3 24	10 0
Bromley.....	1 4 13	10 66
Bickley.....	1 5 27	11 74
St. Mary Cray.....	1 8 24	14 65
Swanley Jct.....	1 11 15	17 52
Farningham.....	1 13 50	20 39
Fawkham.....	1 16 35	23 28
Meopham.....	1 19 18	25 75
Sole Street.....	1 20 18	26 69
*Strood.....	1 26 1	32 75
Rochester.....	1 27 2	33 58
Chatham.....	1 27 45	34 28
New Brompton.....	1 29 48	35 75
Rainham.....	1 33 0	38 77
Newington.....	1 35 31	41 49
†Sittingbourne.....	1 38 25	44 58
Feynham.....	1 41 42	47 78
Faversham.....	1 45 47	51 70
Selling.....	1 49 31	55 24
Canterbury	1 56 11	61 66
Bekesbourne.....	1 59 8	64 56
Adisham.....	2 2 3	67 61
Shepherd's Well.....	2 6 18	71 53
Kearsney.....	2 9 27	75 7
Dover Priory.....	2 11 33	77 25
Dover Town & Harbor	2 12 26	77 76
Dover Pier.....arr.	2 13 18	78 34

*Reduced speed over the sharp curves after Strood.
†Reduced speed over bridge (repairing).

CALAIS (MARITIME) TO AMIENS (CHEMIN DE FER DU NORD.)

Engine 2153 (latest type of Nord compound) and train load of 95 tons nearly.

Stations.	Actual time. p. m. H. M. S.	Distance. Kilometres.
*Calais Maritime.....dep.	3 48 8.	
†Calais-Ville.....	3 50 53	2.6
Fontinettes.....	3 52 40	4.7
Frethun.....	3 56 38	10.0
Pihen.....	4 0 35	15.0
Caffiers.....	4 3 52	19.0
Le Haut Banc.....	4 6 50	24.0
Marquise-Rinemont.....	4 8 34	27.2
Wacquinghem.....	4 12 0	33.1
Audenque.....	4 14 30	35.5
‡Tintelleries (Boulogne).....	4 17 10	42.3
Pont-de Briques.....	4 22 12	48.9
Hesdigneul.....	4 24 36	52.7
Neufchatel.....	4 28 12	57.8
Dannes Camiers.....	4 31 39	63.5
Etaples	4 35 28	70.9
St. Josse.....	4 38 45	76.9
Rang-du-Thiers Verton.....	4 41 54	82.2
Conchil-le-Temple	4 45 34	88.2
Quend.....	4 48 30	93.1
Rue.....	4 51 38	98 3
Noyelles.....	4 57 38	108 2
Port-le-Grand.....	5 1 2	113.7
Abbeville.....	5 5 52	121.8
Pont-Remy.....	5 11 7	130.5
Fontaine-sur-Somme.....	5 13 25	134.2
Longpré.....	5 15 36	139.3
§Hangest.....	5 20 13	145 6
Picquigny.....	5 25 28	152.5
Ailly-sur-Somme.....	5 29 18	157.2
‖Saint-Roch.....	5 34 18	164.6
Amiens.....arr.	5 38 11	166.6

*Checked by signals after Calais-Ville.
†Slowest speed up the long bank of 1 in 125 out of Calais was 45 miles per hour.
‡Nearly stopped by signals after Boulogne.
§Ran slowly after Hangest—train in front.
‖Badly checked by signals after St. Roch and stopped for 29 secs. outside Amiens.

AMIENS TO PARIS (NORD), CHEMIN DE FER DU NORD.

Engine 2,154 (latest type of Nord compound) and trainload of 95 tons nearly.

	Actual time. H. M. S.	Distance. Kilometers.
Amiens.....dep.	5 51 21	.....
Longueau.....	5 55 22	4.6
*Boves.....	5 58 8	8.6
Ailly-sur-Noye.....	6 5 28	19.5
La Faloise.....	6 10 7	26.4
Breteuil.....	6 15 55	35.7
Chepoix.....	6 17 26	38.0
Gannes.....	6 20 42	43.3
St. Just.....	6 25 26	51.1
Clermont.....	6 33 32	65.5
Liancourt.....	6 37 54	72.9
†Laigneville.....	6 40 1	76.4
Creil ..... arr.	6 42 53	80.3
" .....dep.	6 46 48	.....
‡St. Maximin.....	6 53 58	86.0
Orry-la-Ville.....	6 57 46	95.6
§Survilliers.....	7 1 16	100.9
Louvres.....	7 6 15	107.0
Goussainville.....	7 8 24	111.1
Villiers-le-Bel.....	7 10 55	115.8
Pierrefitte.....	7 13 14	120.5
‖St. Denis.....	7 15 13	124.5
Paris (Nord).....arr.	7 22 12	130.6

* The speed on the long ascent from Amiens to Gannes (mostly 1 in 250 and 1 in 330) was just barely 60 miles an hour.
† Badly checked twice after Laigneville and stopped especially at Creil.
‡ Train ran up the long ascent of 1 in 200 from Creil to Survilliers at average speed of 53 miles per hour.
§ Lost nearly 1½ minutes by bad check (signals) between Survilliers and Louvres.
‖ Last 2½ miles into Paris, took 5 mins. 48 secs., due to two signal checks and a stop of 28 secs. for signals.

Pneumatic Car Equipment.

One of the most novel exhibits at the M. C. B. Convention last month was a private car of the Pittsburgh & Lake Erie Railroad fitted up with air mattresses for the berths and air cushions for the chairs. The work of equipping the car was done by the Ruth Equipment Co., of Pittsburgh, Pa., of which L. T. Ruth is President, and the car had been in actual service.

A section was arranged as a drawing-room car and sleeper combined. The chairs revolve and are covered with leather. When the car is used as a drawing-room

car, the bedding is placed in a separate closet in the car and the air mattresses are folded in recesses behind the berth partitions, which, when not in use, are swung on hinges so that they are flush with the side of the car. These partitions contain wooden shutters the same size as the windows, which may be lowered so that no light will be excluded from the car.

Air for the special equipment is supplied to a separate reservoir, but only after the brake reservoir has been supplied with air to the required pressure. Thus if a pressure of 65 lbs. is required in the brake system no air would be taken to supply the special reservoir for the pneumatic equipment until the pressure in the train pipe and brake reservoir has reached that amount. Then it will take all the extra air pumped until the pressures equalize, at which time air is no longer supplied to either. Separate index hands on a single gage indicate the pressure in the two reservoirs.

In order to change from the drawing-room car to the sleeper, the air in the seats of the chairs is permitted to escape, the backs are removed and hooked to the body of the chair in such a manner as not to interfere with the lower berth. The partitions are then swung about at right angles with the side of the car, the air mattresses are drawn out and filled by opening the valve in the pipe leading to the special reservoir. The bed is then made up by the porter and curtains hung in front of the berth in the same manner as in the common style of sleepers.

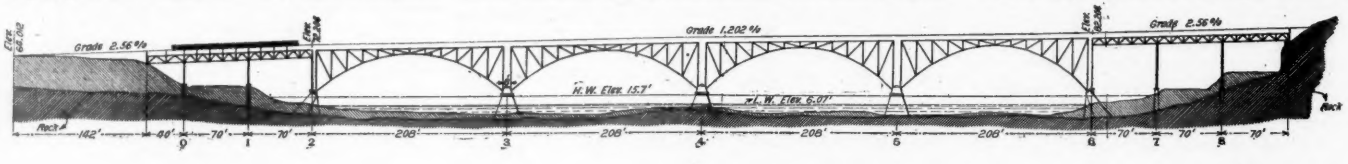
A special pressure governing valve is designed to keep the pressure in the mattresses and chairs constant, even should there occur a leak in the rubber. This is a very important feature and has been overlooked in some systems that have been tried. The aim of the company has been to bring out an equipment that will at once give an economy of space and provide a healthful and comfortable car for travelers.

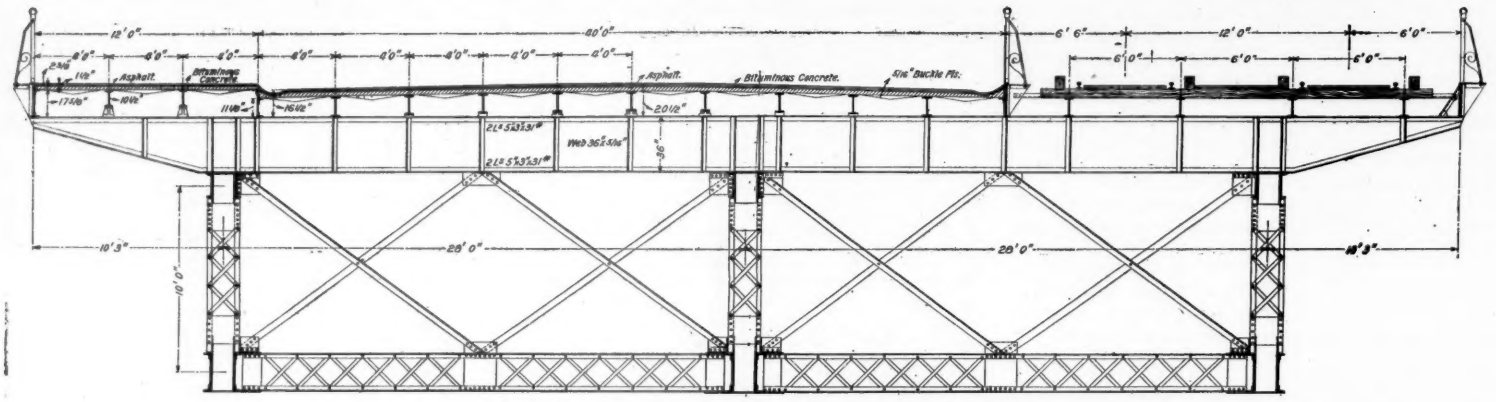
Proposed Bridge Over the Schuylkill.

The accompanying cut shows the general plan of the proposed bridge over the Schuylkill River, near Straw berry Mansion, in Fairmont Park, Philadelphia, the contract for the steel work of which has been given to the Phœnix Bridge Co., Phœnixville, Pa. The structure will be of ornamental design, 1,222 ft. long, with sidewalk, roadway and electric car tracks, and will contain about six million pounds of metal. The bridge is designed for a live load of 100 lbs. per sq. ft. on sidewalk and roadway, and for 1,000 lbs. per linear ft. on each electric car track for floor and lattice girder spans; and for a load of 80 lbs. per sq. ft. on sidewalk and roadway for trusses, the load on car tracks remaining the same as before.

The foundations will be simple, being laid on rock at the bed of the river. This foundation work is being done by O. M. Weand, of Reading, Pa., and Stewart & McDermott, of New York.

The bridge is to be completed before April 1 next.





Proposed Bridge over Schuylkill River at Fairmont Park, Philadelphia.

Mr. RUSSELL THAYER, *Chief Engineer.* PHŒNIX BRIDGE CO., *Contractors.*

Comparative Performances of Locomotives.

The Richmond Locomotive & Machine Works write to us as follows:

"The enclosed is the report of the working of our Compounds on the C., C., C. & St. L., showing the performance of 12 simple engines and two compounds. It was upon this report that General Manager C. E. Schaff ordered us to convert 60 of his simple engines to compound."

PERFORMANCE OF 12 SIMPLE ENGINES—C., C., C. & ST. L. RY.

Eng. No.	Cylinders.	Miles.	Lbs. Coal.	Miles to 1 ton coal.	Car-haul'd 1 mile to 1 ton coal	Lbs. coal consum'd per load'd car-mile.	No. loaded cars per train.	No. days in shop.
351	19 × 24	20,790	2,701,000	15.38	373.31	5.36	24.3	29
428	" "	24,717	2,494,000	19.82	462.45	4.33	23.3	
430	" "	20,265	2,410,000	16.82	421.81	4.74	25.1	31
431	" "	22,639	2,418,000	18.73	439.20	4.55	23.5	26
432	" "	17,144	1,984,000	17.73	367.36	5.44	21.3	30
434	" "	20,999	2,124,000	19.77	473.43	4.22	23.9	29
462	" "	21,855	2,418,000	18.08	453.65	4.41	25.1	29
463	" "	24,838	2,692,000	18.56	448.96	4.45	24.5	
464	" "	21,717	2,362,000	18.39	409.90	4.88	22.3	29
467	" "	23,465	2,390,000	19.55	415.02	4.82	21.1	35
469	" "	19,652	2,798,000	16.39	405.52	4.91	24.7	46
476	" "	26,351	2,292 000	22.99	504.76	3 96	22.0	
		264,252	28,686,000					284
Genl. Ave.		22,021	2,390,500	18.42	431.25	4.64	23.4	24

Performance of two Richmond Compound Engines.

429	32 × 24 20 × 24 30 × 24	24,944	2,444,000	20.41	543.03	3.68	26.6	
472	13 × 24	25,067	2,130,000	23.54	604 32	3.31	25.7	6
Average . .		25,005	2,287,000	20 99	571.57	3.50	26.1	3
Per cent of saving			4.2	11	33	25	11.5	

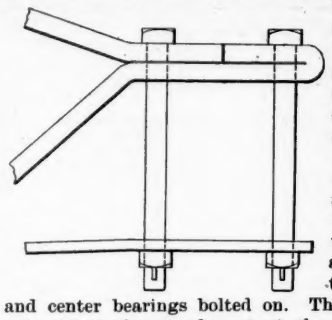
Notes on Some of the Convention Exhibits.

Steel Castings.—Steel castings seem to have taken their place as an integral part of car and locomotive construction, if we are to accept the evidence of the exhibit of the American Steel Foundry Co., of St. Louis, Mo. This exhibit was one of the most extensive on the grounds and included tracks, bolsters, couplings, driving wheels, engine frames and miscellaneous castings. Three diamond trucks were exhibited in which all of the cast parts were of steel. In general design they were of the standard accepted type, the transom being dispensed with, the main dependence being placed upon the bolster and wheels to keep the frame in exact alignment, assistance being given by an X brace fastened to the pedestal-tie brace on each side. There was also what was called by the exhibitors a bogie truck, in which the transoms consisted of heavy channel irons bolted in between a cast side beam and the pedestal jaw brace. This wheel beam is of I section and has cast jaws bolted to it to form the pedestals, while the pedestal-tie brace is also a casting. In addition to the complete trucks there were a number of bolsters, 17 in all, showing the different styles used by various roads. These bolsters, which have already been illustrated in these columns, are of an inverted U section with a sufficient thickness and depth of metal in the sides to sustain the test load of 100,000 lbs., to which they are all subjected, without permanent deflection. The centers and side bearings are invariably cast in place, while the lugs for attaching brake levers, hangers and other portions of the truck are frequently treated in the same way. The only casting that is not strictly intended for steam railroad work is the side frame of a street-car truck.

Among the smaller castings exhibited is a front end casting that has taken unto itself a multitude of functions. It has the rubbing plate for the horn of the coupler, the pockets and chafing plates for the ends of the draft timbers, a step and bracket for the brake staff, the guides for the followers and is slotted out to permit of the passage of the equalizing bar of the continuous draw gear. Although so much is included in the combination casting it is comparatively light and does not appear to weigh as much as the total of the separate parts as ordinarily constructed.

Of course there were couplers; some are in an exceedingly dilapitated condition owing to the tests to which they have been subjected for the purpose of showing the quality of the metal. The favorite distortion seemed to be the hammering out of the shank of the drawhead until all semblance to its original shape had disappeared. They were drawn out to a flat bar, twisted to a rude imitation of a propeller blade and twisted like a screw. Other smaller samples were bent double cold to show their physical qualities. Of engine castings there were a driving box, a driving wheel cast from the pattern of the Illinois Central Railroad and a frame for a mogul engine, the latter having been cut in two and welded to demonstrate the capabilities in this direction.

Before turning aside from the car tracks we must call attention to two trucks exhibited by Shickle, Harrison & Howard, of St. Louis. They were of the diamond type; one had an inverted channel-iron spring plank with an open girder, cast-steel bolster, having the side bearings bolted on, and carrying a body bolster of the same design. The other truck had channel-iron transoms with cast-steel spring-slats slung in rigid straps. The bolster was of an open, inverted U section, and, like the other truck, had the side and center bearings bolted on. There was a peculiarity about the attachment of the arch bars to the journal box. The top member was cut off just after passing the center and the lower was turned back in order to form a bearing for the end, a peculiarity of construction that is somewhat unusual.



Another steel casting exhibit that attracted a great deal of attention was that of the American Steel Casting Co., of Thurlow, Pa. The feature of this exhibit was an engine frame for an eight wheel engine in which one of the pedestal legs had been bent down to an angle of 90 deg. with the main plane of the frame. This bending was done cold and the whole twist was made between the two legs, where the metal measured 4 in. in width and 5¼ in. in depth. It was at the forward pedestal that bending was done and in addition to the twist the lower member that reaches out from the bottom of the pedestal to take the front rail was bent up and back of the upper member. The physical characteristics of the metal of the frame, as given by an attached card, were ultimate tensile strength 70,000 lbs. elongation 30 per cent. and reduction of area 49 per cent. Beside the frame was a driving wheel center from whose rim two spokes had been cut free with a section of the rim itself. The spokes had then been turned down at right angles to the plane of the wheel and twisted. This work was al o done cold, and the physical properties of the metal was: ultimate tensile strength 68,500 lbs.; elongation 28½ per cent., and reduction of area 47 per cent. [See *Railroad Gazette*, June 26, for an engraving of this wheel.]

This matter of the casting of engine frames attracted a great deal of attention among the members of the two associations. The comments on the examples shown were favorable not only on account of the lower price at which the cast frames can be made, but there was also a disposition to believe that the metal would actually be more reliable than in the forged frames.

Steel has already entered into the permanent construction of locomotives in the shape of driving boxes, wheel centers, crossheads and rockers, and now bids fair to take its place in the frames, just as it is supplanting cast iron for many parts of car construction. Indeed, in the latter case, steel castings and other metals bid fair to become active competitors with wood in the near future for the underframing of cars.

Steel Cars.—That the steel car is the car of the future is an opinion that was more frequently expressed upon the veranda than ever before. It is probable that this opinion was brought out to a great extent by the exhibit of metal cars that was made upon the tracks of the Delaware & Hudson Canal Co. a couple of blocks from the hotel.

Great attention was given to the Pennock steel car, which is certainly a fine piece of careful designing. Viewed from the standpoint of the car repairer it is remarkable. The metal car has always been distrusted by

the car builder, because a car must be of such a design and composed of such materials that repairs can be readily made. Whether a mental photograph of a collision was actually dangling before the eyes of the designer of the Pennock car or not we are unable to say, but this much is certain that he has succeeded in designing a car in which repairs are rendered phenomenally easy. There is not a bolt or nut or rivet or piece of metal that cannot be removed and replaced without disturbing the adjacent parts. There is not a nut in the whole structure that is not so perfectly easy of access that it can be readily turned with a monkey wrench. Every bolt head can be reached with a wrench or is held by a plate alongside or in a socket, so that it need never turn when running the nuts on or off. The draw gear can be taken down and replaced without trouble and the inside or freight surfaces of the car are absolutely devoid of projections.

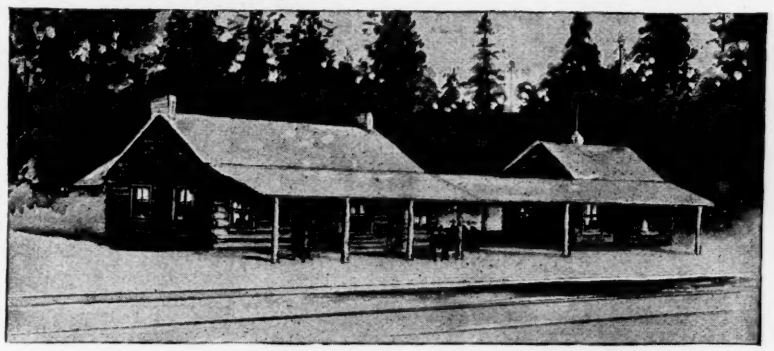
We should not leave this subject of steel cars without mention of the Carnegie exhibit and of that of the Schoen Pressed Steel Co. The Carnegie Company exhibited the steel cars which were described in considerable detail in the *Railroad Gazette* quite recently, and the Schoen Company exhibited bolsters of several patterns and also the Schoen steel truck frame which we have recently described at length.

Heating Equipment.—But the freight car and the locomotive did not monopolize the whole space of Congress Hall court. The passenger car received its full share of attention, and there were curtains and seats and springs and ventilators, but the largest exhibit was that of the Gold Car Heating Co., of New York. They showed the complete equipment of a passenger coach, with 450 ft. of pipe, a Baker heater and their sealed jet. Then they had traps and couplers and safety valves. The traps work on the principle of an expanding body of metal closing the outlet, and as the water of condensation gathers about this metal and cools, the latter contracts, opens the valve, and the surplus water escapes. Among the ingenious contrivances to accomplish this same end is the gravity trap, arranged to be placed horizontally in the coupling head of the steam hose. So long as there is a pressure on the hose this valve is kept closed, but the instant that pressure is relieved the valve tilts over on one side, opens its passage and allows the water and vapor contained in the loop of the hose to escape. There are also a number of electric heaters, which are intended for street railway service.

Pneumatic Tools.—Close by was the exhibit of the Chicago Pneumatic Tool Co., consisting of a sand-papering machine, a staybolt drill, a rotary cylinder drill, a carpet cleaner, a pneumatic belt shifter and a pneumatic hammer for chipping, calking and beading. Compressed air and pneumatic machinery is entering so largely into shop economics at the present time that every new tool in which an advantage is taken of the wide adaptability of its properties is looked upon and investigated with a great deal of interest. As it is impossible to convey an adequate idea of these tools without engravings, we postpone a further consideration of them.

Passenger Station at Bemis, Me.

The Portland & Rumford Falls Railway has lately been extended to the Rangeley Lakes, and the passenger department is advertising the line with an enthusiasm worthy of a Daniels or a Ford. As repeated perusals of passenger-department literature have somewhat abated our enthusiasm on the subject of lakes and mountains mosquitos and dining cars, we will leave the reader to inform himself on this part of the subject at first hands (he can get some elegant literature by sending to Mr. R. C. Bradford, the Traffic Manager of the road, at Port, land, Me.); but the station building at Bemis, the terminus, being somewhat of a novelty, will be of interest to the readers of the *Railroad Gazette*, and we show herewith a picture of it, copied from the advertisement of the road. The general passenger agent believes that this building "is the embodiment of just what the nineteenth century tourist delights to find in his roamings through the wilderness—the simplicity of Nature, modified by the addition of such comforts and luxuries as he has learned to consider essential to his existence." It is made of logs in their rough state, many retaining the moss and lichens of the forest on their sides, only smoothed sufficiently to make them fit together as compactly as possible; and the chinks are filled in with moss. This station consists of two cabins constructed in this way, and connected by a platform and awning; the larger being for passengers and the smaller for baggage. The interior of the former is one long room with a great open fireplace of brick built into it at one end. The separation for the ticket office is made by standing smaller logs on end, forming a sort of stockade. The windows are modern, but the doors with their primitive latches, made of branches "formed in various knotty ways by Dame Nature herself," take you right back to the time of King Philip and of the fellows who gave those jawbreaking names to the lakes down there. As no account of Maine scenery is complete without mention of this humorous feature—the names of the lakes—we append a few which the Portland & Rumford Falls takes particular delight in: Mooselucmaguntic, Cupsuptic Oquossoc, Molechunkamunk, Welokennebacook, and Umbagog. These are the Rangeleys; all connected by narrows or streams, forming a continuous water communication of 60 miles.



Passenger Station at Bemis, Me.

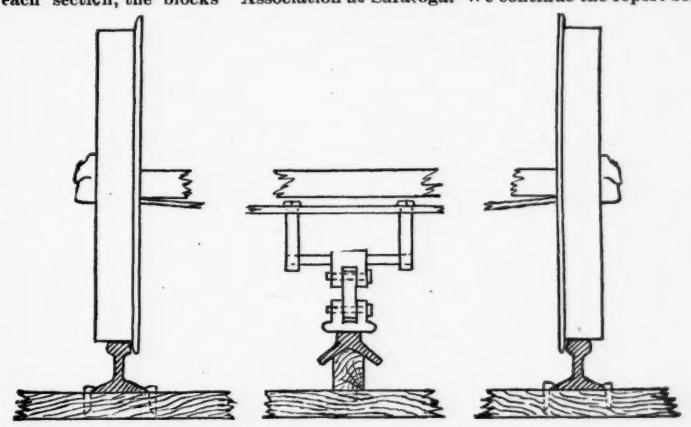
Portland & Rumford Falls Railroad.

The Electrical Equipment of the Nastasket Beach Line.

The New York, New Haven & Hartford has extended the electrical equipment of the Nantasket Beach line as far as East Weymouth, 3½ miles along the South Shore Branch of the Plymouth Division. The overhead trolley in use on the Nantasket Beach Branch will be abandoned if the third-rail contact is adopted. While the third-rail system for electric roads is not new, this is the first instance of a third rail being laid on the permanent line of a steam road, between the rails of the service track.

The current for the third rail section is brought from one of the power-houses on the Nantasket line, over two insulated feeders of copper cable laid along the tops of the two poles which carry the overhead wires of the Nantasket line. At the Nantasket Junction station the feeders are dropped to the ground, and each is connected to its own third rail.

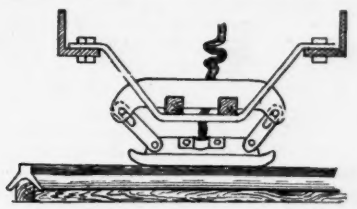
The third rail is of peculiar shape, the end view resembling a flattened *A*. It is laid midway between the two service rails of each track. Each section of third rail is 30 ft. long, and weighs 93 lbs. to the yard. It is supported by three ash blocks to each section, the blocks being let into the ties. Before use these blocks are boiled in vacuum pans with a tar compound, and thus each block is filled with insulating and preservative material. The insulation is almost perfect. The continuity of the third-rail circuit is secured by attaching each end of one rail to that of the next by means of two heavy copper bonds. The line between Nantasket Junction and East Weymouth is absolutely distinct electrically from that between the first named stations and Pemberton. It is fed by its own feeders and is provided with its own automatic safety appliances, which, in case of carelessness or accident to the third-rail section, enter into action and cut all electricity off from it, rendering it nothing more than a peculiarly laid stretch of track.



Shoe and Third Rail, Nantasket Beach Branch.

The electricity is taken from the the third rail by two sliding shoes hung loosely from the car, one suspended between the axles of each truck immediately under the king pin by two links which allow it to slide easily over the top of the third rail and make perfect contact with it all the time. The current is brought to the motors through the controllers and circuit breakers, and returns to the track rails by the wheels. The continuity of the return circuit is secured by using a short thick bond of copper cable to join together the ends of each pair of track rails, the ends of the bond being fastened into the flange of the rail. The distance between each of the two shoes on the car is 33 ft. No third rail is laid at the crossings, the circuit being continued between the broken ends by means of lead-covered cables. At crossings less than 30 ft. wide, one of the shoes is always in contact, at wider ones the impetus of the moving car brings the shoes in contact again before the car can come to rest.

The baggage cars in use last year, each equipped with four motors, have been abandoned, and large 16-bench open cars are alone employed as motor cars or locomotives. Sixteen of these cars will be put into service, each equipped with two G. E. 2,000 motors, two



Shoe and Third Rail, Nantasket Beach Branch

series parallel controllers, two automatic circuit breakers—the safeguards from accident to the rest of the electrical apparatus—and an air-pump and motor for the compressed air for the whistle and brakes. The air-pump combination is automatic in its action. As soon as the pressure in the main air-tank falls below 90 lbs. to the square inch a small knife-switch is closed by a spring and the motor starts. The switch is forced open by the air pressure as soon as that in the tank reaches the normal.

The cars leave Pemberton and run with the overhead trolleys as far as Nantasket Junction. The trolley is then pulled down and hooked, and the shoe makes connections with the third rail.

The third rail may ultimately be extended as far as Braintree, on the main line, 10 miles from Boston.

The material for the electrical equipment is supplied by the General Electric Company.

The Poage Water Column.

The cut on the next page shows the "1895" automatic water column manufactured by Mr. John N. Poage, of Cincinnati. This column has a number of excellent points and is an improved form of the "Standard" water column, first made in 1883 by Mr. Poage. The cylinder and piston which control the closing of the valve are separated from the water that flows through the column, and only water that has passed through the precipitating chamber enters this revulating cylinder. This water being free from sand and dirt, will not grind out the working parts. The main pipe has a large waste valve, which is set in summer to prevent waste of water and in winter to allow the water to flow out quickly, preventing it from freezing. The small pipe around the rod connecting the working lever and the valve is drained through the main pipe, as shown in the figure, preventing ice from forming around the rod. The cylinder, piston, valves and other parts receiving much wear are made of brass, giving them great durability.

The Master Mechanics' Convention.

We gave last week a short report of the preliminary proceedings of the first meeting (Monday morning, June 22) of the annual convention of the Master Mechanics' Association at Saratoga. We continue the report below

The Secretary stated that the following amendment offered by Mr. McKenzie, would come up for consideration:

To amend paragraph 1, article VIII., of the Constitution, to provide that the Secretary (from the members of the Association) shall be appointed by a majority of the Executive Committee and that two-thirds of the members of the Executive Committee shall have power to remove the Secretary at any time.

Mr. FORNEY moved the adoption of the amendment as read. Mr. Setchell spoke strongly against the amendment. Messrs. Bart and McKenzie favored it. The amendment was carried, 99 to 7.

Mr. MITCHELL moved that the subject of radial stay boilers be made a special order of business for to-morrow at 12 o'clock, and the Secretary telegraph to the New York Railroad Commissioners, inviting them to be present. Carried.

Mr. HENDERSON read the following letter:

The letter was from Mr. George M. Bond, Manager of

the Gage Department of the Pratt & Whitney Company, who said: "We have finally solved the problem in regard to slotting the final notches; the 0.002 notch seems to have given more trouble than all the others combined. I send you enclosed herewith a sample of steel we have to use to make the saws for milling the 0.002 notches; so you can see for yourself what we have had to deal with. We have finally made it a success, and we are now milling the last of the slots of the first 500 gages, all of which are practically required for orders now in hand. This first lot will therefore be ready for delivery, we hope, in about three weeks. I write this as a matter of information, in case you should attend the meeting, and the question be raised as to the time when these gages may be obtained."

Metric System.—Mr. HIGGINS: I desire to call attention to a bill presented at the last Congress which, if passed, will make the use of the metric system obligatory after 1901. The bill was referred to a committee and is still in their hands. Last week, at the Master Car Builders' Convention, a motion was passed, and I now desire to present that same motion. I move that the Executive Committee of the Master Mechanics' Association be instructed to prepare resolutions, to be forwarded to Congress, expressing the sentiment of the Master Mechanics' Association as being against the introduction of the metric system, especially for shop practice in this country at any time.

Mr. HENDERSON: I would be sorry to see the vote of the association go in such a way that any one would construe it that we were old fogies. The metric system is bound to come. It is only a question of time, and there is no use in staving off the inevitable.

Mr. VAUCLIAM: I am in favor of the resolution. I do not consider that anybody who favors holding on to the yard as a standard is an old fogy. Before we adopt this system, it is wise to consider what it would cost the railroad companies and manufacturing establishments of this country. It would mean an entire revision of all the drawings we have. A great many of our mechanics are rather old, but they are good ones, and it would be a hard matter to teach old dogs new tricks; and they would have to be taught the metric system and how to caliper to it. In our own establishment, we have over 2,000 general plans of locomotives, and all the necessary detail drawings, blacksmith's sketches, etc., and these would all have to be gone over. I can imagine a blacksmith measuring a sketch and figuring up to the metric system. It would require a foreman for each man, and the foreman would have to stay with him, and the trouble would be to get the foreman who understood the metric system.

Mr. HERR: The motion made by Mr. Higgins should prevail. The condition in the European countries when the metric system was adopted was very different from what it is here. In Germany and in other countries they had no one standard measurement, as we have, but a variety of measurements. Mr. Higgins' motion was carried.

A letter was read from the Schenectady Locomotive Works, inviting the delegates to visit the works in Schenectady.

President BLHCKALL stated that the Delaware & Hudson Canal Company would provide a special train.

Mr. MCCONNELL moved that the invitation be accepted and that a committee be appointed to carry out the necessary arrangements for the trip. Carried.

Stevens Scholarships.—Mr. BRADLEY: In view of the statement in the report of the Secretary that the scholarships provided by the association are not being availed of, I move that the Chair appoint a committee of five to review the whole question and report to-morrow at one o'clock.

Mr. SINCLAIR: We have found that most of those anxious to go could not pass the examinations. If you cannot get sons of master mechanics enough to go into the examinations, take the sons of any railroad man. Widen the thing so that you can do that. We should have four scholars there all the time, and there have been five years when we have not had that number. It is very desirable that the change should be made, and the sons of railroad men secure the advantages of that splendid educational institution. Mr. Bradley's motion was carried, and Messrs. Forsyth, Setchell, Bradley, Waitt and Sinclair were appointed as the committee.

Exhaust Pipes, Etc.—Mr. Robert Quayle, the Chairman of the Committee on "Exhaust Pipe and Steam Passages," then read the conclusions of the report of the committee.

EXHAUST PIPES AND STEAM PASSAGES.

(The committee on this subject consisted of Messrs. Robert Quayle, William Forsyth, James McNaughton, W. S. Morris, D. L. Barnes and W. F. M. Goss.)

The committee made a valuable study and a valuable report. The report is very long and accompanied by many engravings, and we shall reprint only the conclusions and a few of the most important statements of the committee.

The work was outlined by the committee as follows:

First. Determine the angle of the exhaust steam jet.

Second. The effect of the shape of the orifice on the angle and shape of the jet.

Third. Determine the effect of height of bridge on the direction of the individual jet.

Fourth. Vary height of nozzle with best form of orifice and height of bridge, as determined by tests two and three, from the highest to the lowest practicable point, with the form of stack recommended by last year's committee.

Indicator cards to be taken to also determine the effect of change of form of orifice on the back pressure in the cylinder.

Fifth. Vary the length of the stack recommended by last year's committee, with nozzle located at the most efficient point as determined by the fourth test.

Sixth. Vary the heights of straight stack that last year's committee recommended, nozzle located the same as in fifth test.

Seventh. Vary the size of the nozzle with the best arrangement of parts, as already determined.

Eighth. Comparative results of double and single nozzles.

It was agreed that work under the first three points should be undertaken in connection with the locomotive testing plant of Purdue University, at La Fayette, Ind., and that the remainder of the work should be done in connection with the testing plant of the Chicago & Northwestern Railway, at West Chicago shops. This division gave to the Purdue University the "Study of the Form and Density of the Exhaust Jet (Part I.)," and to the Northwestern, the "Study of its Efficiency," as effected by all the various changes suggested by the outline (Part II.).

A drawing of the arrangement of exhaust pipe, nozzles and stack found to give the greatest efficiency is shown in Plate 48.

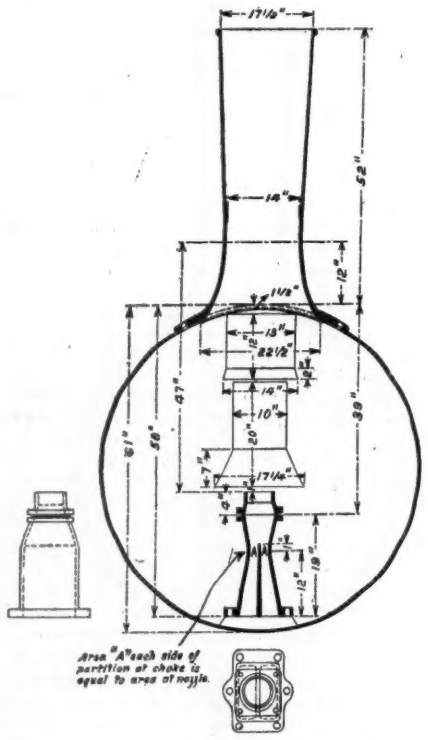
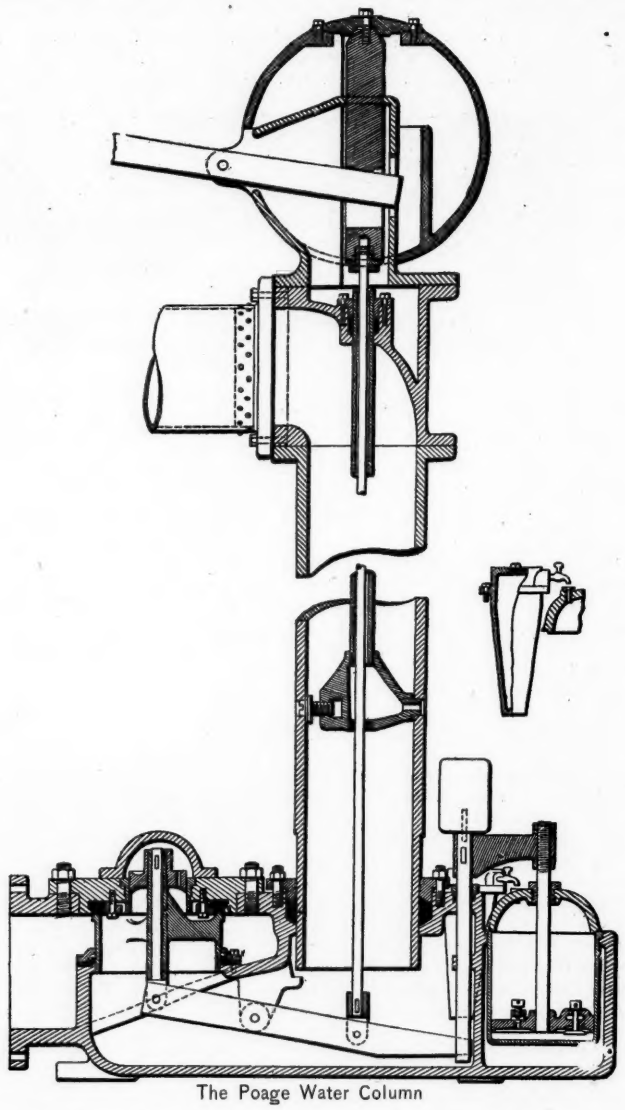


Plate 48.—Arrangement of Exhaust Pipe, Etc, Giving Greatest Efficiency.

With M. M. Report on Exhaust Pipes.



The Poage Water Column

Conclusions (in Reference to Form of Jet).

1. The action of the exhaust jet within the stack is not that of a piston within the barrel of a pump.
2. Draft can as well be produced by a steady flow of steam as by the intermittent exhaust jet.
3. The exhaust jet, under ordinary conditions, does not fill the stack until near its top.
4. The vacuum within the stack at points near its base is greater than that within the smokebox.
5. The jet acts upon the smokebox gases in two ways; first, by frictional contact it induces motion in them; and, second, it enfolds and entrains them.
6. In all jets examined, the induced action was relatively strong and the entraining action weak.
7. Any condition which will tend to solidify or to reduce the spread of the jet appears to effect favorably its efficiency.
8. Changes in stack proportions may greatly affect the form of the jet.
9. In general, a change in the amount of steam discharged will change the form of the jet, the spread being reduced as the volume of steam is increased.
10. Other things being the same, the form of the jet is not much affected by changes in speed or of cut-off.
11. The form of the nozzle has much to do with the form of the jet, and hence with its efficiency.

Design of Exhaust-Pipe and Nozzle.

The work on the Chicago & Northwestern testing plant relates principally to the proper design of an exhaust pipe and nozzles for maximum efficiency, and the results obtained are believed to confirm the following conclusions:

First. The exhaust pipe should be as short as possible, with a proper arrangement of diaphragm and netting, provided this does not make it less than 19 in. high, which was the lowest limit tested.

Second. The bridge in this pipe should be not less than 13 in. high.

Third. The area of each of the openings of the pipe at the most contracted part should be not less than the area of the nozzle.

(This conclusion may only be true for the particular form of pipe and location of the choke used in the above experiments.)

Fourth. When it is necessary to reduce the area of the exhaust opening, it should be done at the nozzle and not at the choke.

Fifth. The nozzle should be raised when necessary by lengthening the portion of the pipe above the top of the bridge, rather than that below.

Sixth. The form of exhaust tip shown as tip *X* in these tests gives better results than either forms *Y* or *Z*.

Seventh. The distance from the choke of the stack to the nozzle for 14-in. choke stack 52 in. long should not exceed 50 in., nor be less than 40 in. for maximum efficiency.

Eighth. The distance from the top of the smoke arch to the nozzle, with 14-in. straight stack 52 in. long, should not be greater than 38 in., nor less than 23 in.

Ninth. The distance from the top of the smoke arch to the exhaust nozzle, with a 16-in. straight stack 52 in. long should not be greater than 38 in. nor less than 28 in.

Tenth. The efficiency of the steam jet is reduced by spreading it by means of crossbars in the nozzle.

Eleventh. Crossbars, not wider than ⅜ in., placed in the nozzle, or above it, nearer than 1 in., increase the back pressure; wider crossbars increase the back pressure, when further removed, in proportion to their width.

Twelfth. A petticoat pipe with the single nozzle, when properly arranged, increases the efficiency of the jet.

Thirteenth. Double nozzles, with 14-in. choke stack and 16-in. straight stack, 52 in. long, are not as efficient as single nozzles, the difference being very slight.

Fourteenth. Double nozzles should be located with reference to the stack the same as single nozzles.

Conclusions from the Von Borries-Troske tests on the effect of various lengths of conical and cylindrical stacks:

Fifteenth. The maximum height of stack, measured from the exhaust nozzle, if the diameter at the choke is properly chosen, need not exceed five times this diameter. For cylindrical stacks the ratio of diameter to height is the same.

Sixteenth. The vacuum decreases as the stack is shortened, and more rapidly with cylindrical than with conical stacks.

Seventeenth. The decrease in vacuum due to shortening the stack within certain limits can be nearly overcome by lowering the nozzle. The amount which the nozzle should be lowered with cylindrical stacks is almost equal to the amount the stack is shortened. With conical stacks the nozzle should be lowered about two-thirds as much as the stack is shortened.

Plate 48 shows the arrangement of exhaust pipe, nozzle, petticoat pipe and stack, which gave the best general results as to vacuum and efficiency in the committee's tests. An inspection of the results of the tests will show that certain variations from the above change but slightly the effectiveness of the draft appliance. The limits within which the different parts experimented with can be changed without materially affecting the efficiency of the apparatus as a whole, are as follows:

First. Height of the bridge should not be lower than that shown, although lowering it decreases the efficiency but little.

Second. Distance of the nozzle from the choke of the stack can be from 40 in. to 39 in., preferably nearer the former than the latter.

Third. The area of each opening at the choke of pipe can be decreased below the area of the nozzle as much as 20 per cent. without greatly decreasing the efficiency at speeds and cut-offs experimented with. Preference to the larger opening should be given with engine working generally at short cut-offs.

Fourth. The petticoat pipe can be made to considerably increase the efficiency of the draft apparatus in boilers of this diameter and probably larger, but it must be carefully adjusted to the exact draft conditions of the engine. This can probably only be done with the engine in actual service. In boilers of smaller diameter, a petticoat pipe is probably of little or no service. The committee's tests are not sufficiently comprehensive to give the limits of this adjustment. They indicate, however, that the top of a 13-in. top section should not be higher than 2 in. below the top of the smokebox with 14-in. choke or 16-in. straight stack.

Fifth. The 14-in. choke stack could probably be shortened without materially affecting the vacuum. By how much, the Committee's tests do not show. A straight stack must be larger than 14 in. diameter, but neither 14-in. or 16-in. straight stacks give as good results as the choke stack, although the 16-in. straight stack shows much better results than that 14 in. diameter.

Mr. QUAYLE: You will find the stack which the committee recommends on plate No. 52. You will find three stacks—14 and 16-in. straight stacks and 17½-in. tapering stack, and the committee recommends the tapering stack, with a 14-in. contraction, 12-in. from the base. This was on a 19 × 24-in. locomotive. In plate 48 you will find the general arrangement that gave us the highest efficiency within the limits of the test. We found that a nozzle having two-inch parallel walls gives greater efficiency than those with a more abrupt conclusion at the top, and also better results than a gradual taper. We had everything in the front end except the netting; and inasmuch as these tests are simply for the comparative value, we concluded that would not make any difference, so far as the value of the efficiency was concerned, comparatively.

We have on the Chicago & Northwestern two sizes of stacks, so far as the tapering of the stack is concerned and so far as the contraction is concerned.

Mr. MITCHELL: The stack is what we have used for the last four years, same dimensions, throat and top, and about the same height. We use it on everything, 16 × 22 up to 25 × 26, and get good results.

Mr. QUAYLE: We found with that diameter of front-end arrangement that it did slightly increase the efficiency by the use of the petticoat pipe. It was caused by tending to solidify the jet of steam and thus increasing the velocity and increasing the induced action of entrainment.

Mr. VAUCLAIN: Could the sizes arrived at be used in a proportional manner for the various sizes of locomotives? Would it be safe to increase or decrease the the sizes in direct proportion to each other, conforming to this size for a 19×24 engine?

Mr. QUAYLE: The experiments did not conclusively prove that, but the committee is of the belief that it will apply to any class of engine, that these proportions can be used, even to the designing of an exhaust pipe for the different sizes of cylinders or engine power.

In the previous report are the recommendations giving length of front end, arrangement of diaphragm, etc. The things not touched upon in this report are considered as being approved in that report. I would say, as chairman of the committee, that it would be well for this association to take time to digest the report, before we talk about continuing the committee.

MR. SETCHELL: This is one of the most important reports that has come before this association. I move that this be made a special order for discussion at 9 o'clock to-morrow morning.

MR. HERR: The time proposed to be allotted is rather short for an intelligent discussion of this report. It is a voluminous report and contains a great deal of data that will require considerable time to go over and properly digest, and which must be done before an intelligent discussion of it can be had. I would amend Mr. Setchell's motion that this topic be made a special order for our next meeting; that the roads experiment with the arrangement recommended, and the committee be continued in the meantime. Carried.

Counterbalancing.—The report of the Committee on Counterbalancing Locomotives was then read by Mr. Herr.

COUNTER-BALANCING.

(The committee consisted of Messrs. E. M. Herr, W. H. Lewis, C. H. Quereau and S. P. Bush.)

The committee, knowing the great amount of time which this subject has been given in the different railroad clubs of this country and the thoroughness with which it has been investigated, have first tried to ascertain what rules and methods are now generally employed on the principal American railroads. Nineteen responses were received, divided as follows. All those replying balanced the full weight of the revolving parts in each wheel, to which was added various proportions of the reciprocating parts as follows: Ten, two-thirds of the reciprocating parts divided equally between all drivers. Four, three-fourths; two, less than two-thirds and three various other methods.

Your committee have formed the rules which follow after full consideration of the following fundamental principles:

First. The weight of the reciprocating parts that are left unbalanced should be as great as possible, consistent with a good riding and smooth working engine.

Second. The unbalanced weight of the reciprocating parts of all engines for similar service should be proportional to the total weight of the engine in working order.

Third. Total pressure of the wheel upon the rail at maximum speed when counter-balance is down must not exceed an amount depending upon the construction of bridges, weight of rail, etc., and when counter-balance is up the centrifugal force must never be sufficient to lift the wheel from the rail.

A majority of railroads answering the committee's circular leave unbalanced one-third of the reciprocating parts. In order to see how nearly this method makes the unbalanced weight of the reciprocating parts proportional to the total weight of the engine, we have plotted on Plate No. 1 the relation of the unbalanced reciprocating weight on one side and the total weight of 75 road engines in actual satisfactory service on seven different roads. On the same diagram are drawn lines, all the points in which are proportional to the total engine weights laid off on the horizontal. The first line marked $\frac{1}{400}$ is drawn through about the average of all the points plotted, and indicates that the average unbalanced weight of the reciprocating parts on one side of engine as balanced on these roads is $\frac{1}{400}$ of their total weight. The upper line marked $\frac{1}{360}$ represents the ratio of unbalanced reciprocating parts on one side to the total engine weight, recommended by Mr. G. R. Henderson, Mechanical Engineer of the Norfolk & Western Railroad, in an admirable report on this subject made to Mr. R. H. Soule, about a year ago, and to which your committee is indebted for valuable data and suggestions. Mr. Henderson proposes the following formula for expressing the relation between the unbalanced reciprocating parts and the total weight of the engine:

$$Wr = \frac{Wt}{360}$$

Wr = the weight of the unbalanced reciprocating parts on one side.

Wt = the total weight of the locomotive in working order.

From the data obtainable, we believe this formula allows a greater proportion of the reciprocating parts to remain unbalanced than present good practice will warrant.

The intermediate line marked $\frac{1}{400}$ on diagram, Plate No 1, indicates the average maximum of unbalanced weight of reciprocating parts in locomotives now in service on various roads. From actual tests of locomotives so balanced in fast passenger service, we recommend it as a safe formula for the maximum limit of the weight of the unbalanced proportion of the reciprocating parts on one side.

In formulating the following rules, it is assumed that the driving-wheels are finished and mounted on their axles with pins in place.

In designing new locomotives the proper counterbalance weight should be calculated and cast into the wheel centers as follows:

Place the center of gravity of counter-weight opposite the crank pin as far from the wheel center as possible, and have it come as near the plane in which the rods move as proper clearance will allow. To obtain weight of the reciprocating parts and detachable revolving parts, proceed as follows:

Reciprocating Parts.—Take the sum of the weights of piston complete, with packing-ring, piston-rod, cross-head complete, and the weight of the front end of the main rod complete. Weigh each end of rod separately supported.

Revolving Parts.—We gh the back end of the main or connecting rod, and each end of each side rod complete, separately supported. The sum of the weights so found which are attached to each crank pin are the revolving weights for that pin.

After consideration of the above we recommend the following:

Rules for Counter-Balancing Locomotive Driving-Wheels.

First. Divide the total weight of the engine by 400; subtract the quotient from the weight of the reciprocating parts on one side as found above, including the front end of the main road.

Second. Distribute the remainder equally among all driving wheels, adding to it the weight of the revolving parts for each wheel. The sum will be the counter-balance required if placed at a distance from the wheel center equal to the length of the crank.

Cautions and Limitations.—In order that the wheel shall never leave the rail, 40 times the portion of the weight of the reciprocating parts added to each wheel must not exceed its static pressure on the rail. To insure safety it should not exceed 75 per cent. of such pressure. Nor should this amount, when added to the static wheel pressure, exceed the safe maximum pressure allowed on track and bridges. Locomotives with rods disconnected and removed should not be hauled at high rates of speed. Make reciprocating parts as light as possible. Spread cylinders as little as possible.

Mr. BARR: If we counterbalance our engines in this way, what points shall we look to determine whether we have the thing right?

Mr. HERR: The only change from the present recommended practice that these recommendations advise is to procure uniformity in the matter of counterbalancing, with a view of letting those engines which can have a larger portion of their reciprocating parts left unbalanced remain without it, and thus save the blow upon the rail or bridges, due to a heavy overbalancing of the wheel. On plate I, you will see that all this plotting is done from engines with two-thirds of the reciprocating parts balanced in the wheel, equally distributed; and you will note with engines of a given weight the amount of overbalance in the engines varies greatly. The committee thinks it is unnecessary that it should vary; that if an engine weighs a certain amount it can stand a certain amount of unbalanced reciprocating parts, without affecting the smooth working of the engine or its riding qualities. It is with a view of ascertaining what is the greatest amount of unbalanced weight that can be allowed in this engine—the more unbalanced weight you can allow, the less you overbalance the wheels and pound the track—that this recommendation is made. There is no doubt that an engine with the greatest weight on the forward truck, other things being equal, will hold a more unbalanced weight without disagreeable motion or injury to the engine than an engine with less weight on the forward truck. Engines with small rigid wheel base will perhaps be more easily vibrated, and more sensitive to it than those with a longer rigid base, which would take more power at the front end to move them. These points can only be investigated thoroughly by actual practice, in service, under different conditions, as different roads find them.

MR. JOUGHINS: The question of Mr. Barr is important and it certainly affects me in my practice; that is, how are we to know when an engine is properly balanced; what effect will it have on engine, or what will show that an engine is properly or improperly balanced? In the Southwestern Railway Club some of our members said that a track laid on a sandy soil had an important bearing on the proper counterbalancing of an engine. We have some engines with which we haue a great deal of difficulty, because they are improperly balanced. The tires flatten so quickly that we cannot run them for a reasonable mileage without having to take the tires off and turn them. Are there other things besides the actual balancing of the locomotive to be taken into consideration? The committee ought to point out the things to be taken into consideration. They should at least point out what is the wrong method of running an engine; or have the tracks laid on sandy soil such a bad influence as some people claim?

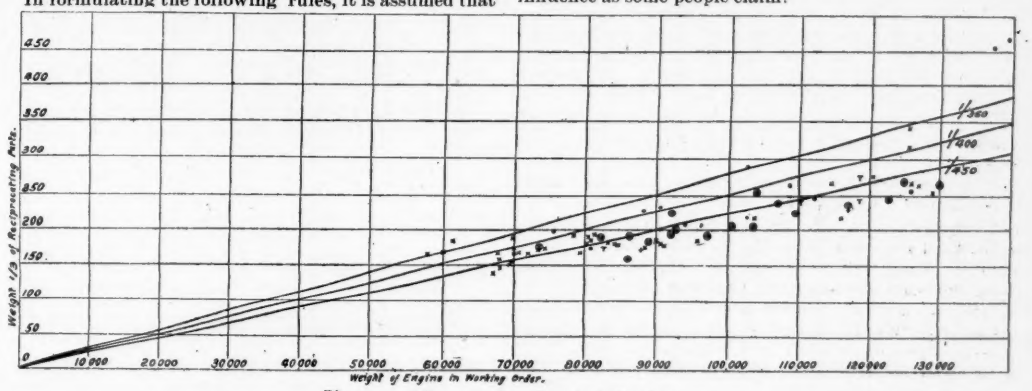


Diagram of Locomotive Counterbalancing.

Mr. HERR: I would refer the gentleman to page 228 of last year's report. The report occupies the rest of the book pretty nearly, on that very question. The question is pretty well covered there. The trouble he experiences, in my judgment, is not due to the counter balancing, and it makes comparatively little difference how he balances his wheels, he will still have the trouble with the flat spots. It is partly due to the sandy track. I doubt if you can get any method of either handling the engine or balancing it, that you will entirely avoid flat spots on a sandy track. The trouble is also partly due to the engineer. The engineer should use great care in not allowing the engine to slip at times, especially at starting. This, in my judgment, would cause the flat spots to occur. If the gentleman will try turning the tires around and changing the counterbalance, he will find the spots will occur in the same relative position. That is my experience with over 250 engines.

Mr. LYON: I ask the committee if they recommend any difference in the balancing of locomotives which are intended for variable speeds.

Mr. HERR: It only when you come to high-speed engines that you have any difficulty. If you balance for high speeds you will be all right when you come to low speeds.

Mr. BROWN: Our chief difficulty is with the engines running down the mountains. If we can only prevent the engine from vibrating when running down the mountains, we have no difficulty in pulling the train. After we figure on our balancing, practically, if the engine does not run steady when going down grade, we put a little more balance weight on the main drivers. We have no trouble while we are using steam.

Mr. HERR: That point is exactly correct. The counterbalance of an engine, having the load that engines nearly always have in ordinary service, will never be felt when working under steam; but when you shut off the steam; that is, when you feel the effect of the counterbalancing. The committee believes its method will enable an engine to run smooth cut off. It is the experience of such members as Mr. Brown, who has long grades, where he can judge of the effects of this counterbalancing, that will be valuable to the committee in obtaining correct conclusions.

Mr. ATKINSON: How is the amount of reciprocating weight balanced? I do not think there are any eight-wheel engines, where each engine is balanced on its own basis.

Mr. HERR: The report says: "Distribute the remainder equally among all driving wheels, adding to it the weight of the revolving parts for each wheel."

Mr. ATKINSON: I do not see any engines built that

way; and in the case of the consolidation engine. I would like to know how to get the weight into the main driving wheel.

Mr. HENDERSON: On page 5 is a section which partially covers this, where it says there are certain cautions and limitations to be observed. You are supposed to put it equally among all the wheels, provided you do not get too much, to make the wheels jump or injure your track. You have always got to observe the conditions on page 5.

Mr. VAUCLAIN: As to Mr. Atkinson's question in regard to consolidation locomotives, it has never been the practice to put the full amount of counterbalance in the main wheel, because you cannot get it in the main wheel. It has been the custom to distribute as much as possible of it in the remainder of the wheels, and what you cannot distribute, you let go. You do not find much trouble with consolidation engines, because they are run at low speeds, and most anything will run at low speed. But when you come to high speeds, these variations cannot be remedied If I understood Mr. Atkinson correctly, he stated that he knew of no locomotives built wherein each wheel was separately treated, and that the revolving parts and their reciprocating parts, were taken care of in accordance with the suggestion of the committee. That is the custom of at least one locomotive works and numbers of railroads.

Mr. BROWN: With consolidation engines we can get an advantage by making the drawbar between the tank and engine longer, and allow some lost motion between them. I have put more weight on the two center pairs of wheels; put on all we can get there.

Mr. LEEDS: Our rails were bent sideways, and not up and down. We followed up the matter, and found a certain speed would always show at every point where the rails were bent; and it had to exceed 48 miles per hour. That was the lowest point of speed at which I ever found one of the rails bent, and just exactly the circumference of the wheel. You would find a kink in the rail, first on one side, then on the other, alternately, all the way along, and on investigating the matter I found that we had proper counterbalance, but at the same time it was about 600 lbs. short in each main driving wheel. These were the wheels which were giving way, on account of being the extreme wheels in the engine; they got an oscillatory motion of the engine and rocking at the same time. We did not undertake to distribute the shortage into the front and back wheels, but got as much of it as we could into the intermediate wheels, and have not had any trouble since we adopted that.

We use the same formula identically on 18 × 24 8-wheel engine, with 66-in. drivers, weighing 97,000 lbs., that we do on a 10-wheel engine, 66-in. drivers, weighing 136,000 lbs.; and distribute our counterbalance the same. We run our 66-in. drivers 66 miles an hour; we will run our 45-in. centers, we will say, 45 or 50 miles an hour. I do not see that there is really a great deal of difference. The statistics of the country show that our freight-train speed has increased from about 15 to 20 miles an hour to 30 and 35 miles an hour, on an average; and when they get bananas, it is 60 to 65 miles an hour.

Mr. SMALL: I move that the committee be authorized to designate a number of roads to try the recommendations of the committee in practice and report to the convention of 1897.

Slide Valves.—The report of the Committee on Slide Valves was then read in abstract by Mr. Henderson. The report was accepted and the committee discharged.

SLIDE VALVES.

(The committee on this subject consisted of Messrs. G. R. Henderson, W. H. Thomas, E. E. Davis, Philip Wallis and L. R. Pomeroy. The notes which follow are very much condensed from the report of the committee.)

Your committee on "Slide Valves" was given two problems to solve: 1st, To consider different types of balanced valves, and to determine their economy and efficiency over plain unbalanced valves; and, 2d, To determine the economy and efficiency of Allen ported valves over plain valves.

As few, if any, master mechanics know the value of either of these contrivances in plain figures, it was also decided, if possible, to make some original tests with a locomotive under service conditions. In this determination the committee was peculiarly fortunate, by having the locomotive testing plant of Purdue University tendered it by the kindness of Professor Goss (Associate Member of the Association) and the other officers of that institution. Your committe feels that it cannot sufficiently thank Purdue University for its generous offer, and Professor Goss for the interest and assistance which he gave them.

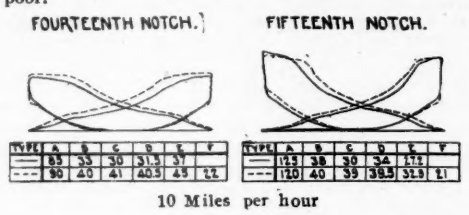
From the replies to the circular of inquiry (constituting only 52 out of the total membership of over 600) we find that of 10,934 locomotives on 50 roads, 7,241 are equipped with balanced valves of some type, and that 145 have piston valves, the latter mostly on compounds. The balanced valves are distributed about as follows:

Richardson	5,945
Morse	482
Barnes	288
American	287
Delaney	42
Margach	30
Leeds	8

The great majority of replies indicated that balanced valves were used in all services, although four members limited their use to freight engines.

In regard to the amount of balance used on the valves, there was a great variety in the statements, which ran from 48 per cent. to 95 per cent. of the total valve area, though the greatest number, by far, gave between 55 per cent. and 65 per cent. of the total valve area.

The answers to the question relative to the wear of seats and valves per unit of distance indicated that a wear of from $\frac{1}{32}$ in. to $\frac{1}{16}$ in. per 100,000 miles might be expected with balanced valves, with from two to three times as much for unbalanced valves, while the wear on the link motion varied in about the same proportion. All the responses strongly favored balanced valves, many of them concluding their views in terms which plainly showed the great esteem in which the balanced valve was held. The expressions in regard to piston valves were all favorable with one exception, this being with a road with five compound locomotives with piston valves. Here the service of this type of valve was rated as "poor."



TYPE	A	B	C	D	E	F
——	85	35	30	31.5	37	
- - -	90	40	41	40.5	49	22

TYPE	A	B	C	D	E	F
——	145	38	30	34	41.5	
- - -	120	40	35	38.5	51.5	21

10 Miles per hour

TYPE	A	B	C	D	E	F
——	95	32	28	30	31.5	
- - -	95	34	36	36	37.5	20

TYPE	A	B	C	D	E	F
——	125	30	23	26.5	21.2	
- - -	125	35	32	33.5	26.8	26

20 Miles per hour

TYPE	A	B	C	D	E	F
——	95	24	20	24	23.1	
- - -	90	24	30	27	30	30

TYPE	A	B	C	D	E	F
——	134	22	17	19.5	14.9	
- - -	128	25	33	31	24.2	66

30 Miles per hour

TYPE	A	B	C	D	E	F
——	100	19	15	17	17	
- - -	119	26	31	28.5	25.5	32

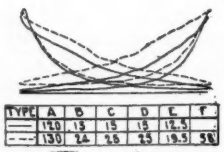
TYPE	A	B	C	D	E	F
——	135	19	13	16	11.8	
- - -	135	25	29	27	20	70

40 Miles per hour

TYPE	A	B	C	D	E	F
——	135	25	20	22.5	16.7	
- - -	137	27	29	28	20.4	22

TYPE	A	B	C	D	E	F
——	135	14	11	12.5	9.3	
- - -	135	21	22	21.5	15.9	71

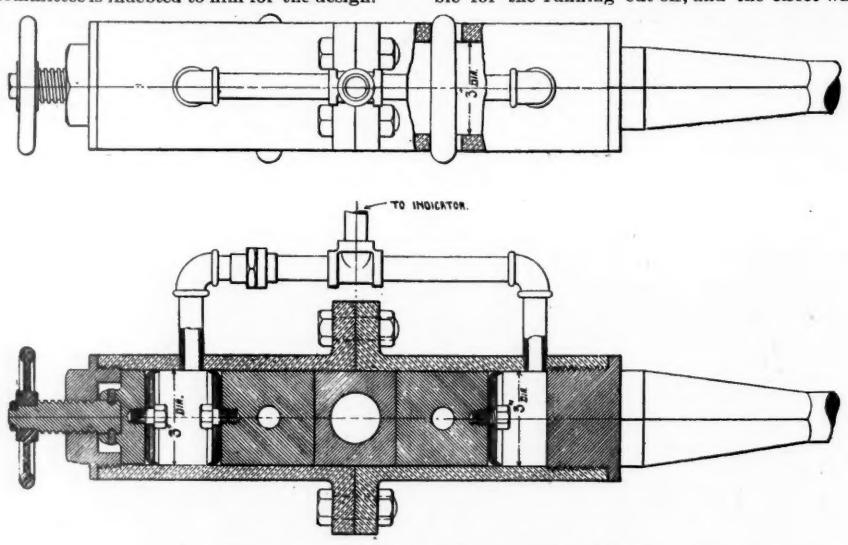
50 Miles per hour.



TYPE	A	B	C	D	E	F
——	120	15	15	15	12.5	
- - -	130	24	26	25	19.5	58

60 Miles per hour.

In order to measure and record the force necessary to move the valves, a dynamometer was constructed by your committee (see Plate 7), and this was connected by a hinged pipe with an ordinary indicator, the motion of the drum being taken from the valve stem. While this dynamometer was rather a crude affair, and not one that the committee would recommend for accurate work, on account of the variable friction of the leathers, and the method of taking up the water used by the indicator, yet it was the best that the committee could obtain, and every effort was made to secure results that could at least be comparable. This is the same style of apparatus that was recently used by Mr. H. H. Warner, of the Northern Pacific Railroad, in some similar experiments, and the committee is indebted to him for the design.



Dynamometer Used in Making Tests of Slide Valves.

(With Report of Committee on Slide Valves.)

Taking, therefore, the average values of all the "H" columns, it is found that the unbalanced valve requires twice as much work to move it as the balanced valves, and your committee believes that this will represent the average results in ordinary railroad practice. Of course, by balancing a large area the friction could be still further reduced, but the danger of the valve's lifting off its seat would be rather great. Your committee, therfore, recommends the following rule for balancinge slide valves:

Area of balance = area of exhaust port + area of two bridges + area of one steam port.

The above to obtain for both Allen and plain valves.

Your committee had hoped to be able to give the results of some experiments with a piston valve on a simple locomotive, but were not able to do so.

Allen Valves.—Your committee decided to treat Allen valves in the same manner as the balanced valves, viz.: issue circular and experiment. Both were done at the same time as the balanced valves. The responses to the circular developed the fact that of 10,934 engines on 50 roads, 513 were equipped with the Allen ported valve. Incidentally it may be mentioned that all but one were balanced. The great majority are used in passenger service only, though several advised that they made no distinction in the use of this type of valve. It also appeared that in some cases an engine with an Allen valve was given one or two more cars than an engine with a plain valve, and also that less lead was used. While the majority of replies showed that the Allen valve was satisfactory and especially advantageous at light speeds and early cut-offs, yet a few condemned the valve as having no advantage over the plain type. One member replied that he had used a few, but removed them, as the Allen port let such a heavy volume of steam into the cylinder with piston near beginning of stroke that it caused a heavy shock, without any favorable effect in power.

In full gear the Allen port doubles the speed of opening and closing of the port, but that as it is wide open with the plain valve, little benefit is felt. However, in the other notches (8th to 15th inclusive) the speed of port opening and closing is not only doubled, but the port opening itself is in most cases doubled. This would lead one to expect a diagram with a steam line more nearly horizontal with this style of valve, and the cards bear out this expectation. At the instant of opening and closing the port, the valve has practically twice the velocity of an ordinary valve, and this is undoubtedly when it is needed. The bad effects of inertia are, however, absent.

The runs were made in the 1st, 8th, 11th, 13th 4th, and 15th notches, and at speeds of 10, 20, 30, 40, 50 and 60 miles per hour, as far as it was possible to obtain them. The work was done in the same manner as in the friction tests, except that there was no dynamometer diagrams to take, and the lubrication was not so carefully regulated. [Only cards from 14th and 15th notches reproduced here.—EDITOR.] Plate 16 gives *fac similes* of the cards taken, the full lines being from the plain valve and the broken lines from the Allen valve. The table under each set of diagrams gives the vital points. From this it will be seen, as might have been expected, that the mean effective pressure with the Allen port is greater than without it at the ordinary running positions. The average value of all the figures under columns "F" shows 20 per cent. in favor of this valve. Of course, it must not be concluded that this 20 per cent. will be gained without an increase in fuel, for from the nature of the argument it has been shown that more steam is admitted to the cylinders, and hence more fuel is necessary, but it can be considered that the Allen port has enabled the piston to exert 20 per cent. more useful pressure on the crosshead of each stroke. It is also readily apparent that the earlier the cut-off the more is gained by the Allen valve. This is also true in a measure of the increase of speed, although it is not so marked as in the case of the ratios of expansion. It is also clearly demonstrated that a better steam line can be obtained. Long ports, or increased travel, may give us good results by the indicator, but here again come the increased weight and area of valve, or the greater speed and longer stroke, both of which mean increased power absorbed in moving the valve with corresponding wear on seat and link motion. This Allen valve weighed 125 lbs., against 85½ lbs. for the plain valve, and the total area was only 190 sq. in., against 161½ sq. in. for the plain valve, and in the case of an engine already built, both of the other methods seem impractical, whereas the Allen valve is easily applied.

Your committee, therefore, believes that this 20 per cent. increase in piston power, due to the Allen valve, can often be realized in practice, and that it must certainly mean greater power developed by the engine, though not necessarily greater power per unit of fuel consumed.

Mr. QUEREAU: I wish to bring out in connection with the Allen valve a point which seems to me important, and which is not touched upon in the report. It is the effect of the Allen valve upon the lead, which is desirable for the running cut-off, and the effect which this has on the steam distribution and the economy of the engine. You will see at once that the lead for the running cut-off should be less for the Allen valve, because of the double opening. This produces two consequent results; one is that the point of exhaust opening is de-

layed in the stroke by reducing the lead. The other is that the point of exhaust closure is also delayed. If the lead for the running cut-off is reduced ⅛ in. by using an Allen valve instead of a plain valve, the point of exhaust opening will be delayed about ¾ in. in the stroke for a 6 in. cut off. The point of exhaust closure will be delayed in the stroke almost an inch, exactly, so that the use of the Allen valve, even though you have the same steam line on your card, the average pressure up to the point of the cut-off, the Allen valve will give you 5 per cent., and in some cases 8 per cent. greater mean effective power. It is an important element of the Allen valve, if properly understood.

Mr. BRADLEY: The committee states an increased efficiency of 20 per cent. in favor of the Allen valve, in some cases. Can we be favored with the names of the roads? If we could only get one or two cars more we want an Allen valve right away.

Mr. HENDERSON: I have all the data at home, and if the gentleman will drop me a line, I will be glad to tell him who gave the answers.

Mr. HERR: I do not doubt that the statement made by the committee that one or two extra cars have been obtained by the use of the Allen valve is correct; but the conditions under which they were obtained should be examined carefully. I have in some recent experiments hauled four more cars with the plain valve by simply changing the lead. As Mr. Quereau has pointed out, the Allen valve enables the lead to be changed, and the result is obtained in that way, which, of course, is a credit to the Allen valve, which enables the lead to be changed in a very beneficial way. In the engine I speak of, the eccentric rods were short, and the valves set for 16 in. lead, with full stroke. When hooked up, we worked the cut-off at an excessive lead, something like 1/16; but it was reduced to ¼ in., and the power of the engine increased very much. We hauled four or five cars more on a train of 40 cars. The data is presented with much clearness in this report, which is a very valuable one. I ask how the difference is accounted for in the ends of the cards, with the last three cards on the 15 notch; one end of the card, with the Allen valve, seems to be little better than the plain valve, while the other end is very much better.

MR. HENNESSY: There were a number of irregularities which crept into the diagram, which we did not attempt to account for. We noticed these irregularities at the time, and thought possibly it might have occurred in the indicators, and the indicators were changed, but it showed the same characteristic.

MR. FORNEY: Has the experiment of the committee discovered anything in relation to the steam consumption? Is there any reason for believing that the amount of steam consumed with the Allen valve is any less than it is with the ordinary slide valve?

MR. HENDERSON: As we say at page 27 of the report, "we believe that this 20 per cent. increase in piston power, due to the Allen valve, can often be realized in practice, and that it must certainly mean greater power developed by the engine, though not necessarily greater power per unit of fuel consumed." The steam line is nearly horizontal, and shows more steam is used. The only thing is that you gain with the Allen valve; get more pressure on your piston, and more work out of the cylinders. We did not make any experiments as to the economy of fuel.

Mr. FORNEY: From the diagrams on page 24, what is indicated is that with the Allen valve you could use a higher rate of expansion for doing a given amount of work, and consequently the steam would be used more economically. In cutting off short, as shown on the second diagram, the engine with the Allen valve would exert more power than an engine cutting off at the same point with an ordinary valve; and we ought to expect a certain amount of economy from the Allen valve. We ought to realize more economy because we expand a little more.

Mr. FORSYTH: The point which Mr. Forney brings out is one which I hoped the committee would demonstrate. The committee concluded from their experiments in the measurement of indicator cards, etc., that although the power of the engine is increased, the economy is not necessarily increased. That, it seems to me, is a legitimate subject for the association to decide in some way. We continue to use the Allen valves and have many in service on our road, and I think that while we are on this subject we ought to decide whether we use the Allen valves because they increase the power of the engine, and only that, or because they improve its economy. I ask the committee what would be the difference, in obtaining any mean effective pressure, if you should use a plain valve, cut-off being enough to obtain the same mean effective pressure as that obtained in the Allen valve with the shorter cut off?

Mr. HENDERSON: It will be seen by looking at the diagrams what is obtained by the use of the Allen valve. With the plain valve you notice that the expansion line merges into the steam line at high speeds almost imperceptibly. The connection is much rounder, whereas with the Allen valve it approaches more nearly to the clean corner. On the 15th notch, at 10 and 20 miles per hour, shows it very well, and sometimes the 14th notch at 20 miles an hour, and then lower down you see the effects of the quick opening and closing. It is a point never disputed that steam should be admitted quickly and cut off quickly; and as the diagrams on page 24 show that the speed of opening and closing is double, that is where we must look for our principal economy in the use of the Allen valve.

Mr. BARR: It seems to me that the diagrams show more back pressure to the Allen valve than to the plain valve; is that true?

Mr. HENDERSON: I do not think they show much more. Take 40 and 50 miles per hour, 15th notch, they show less. In all 15 notches about the same or less. In 14th notch in many cases show less, and in some cases show more.

Mr. BARR: In the diagram on page 24, where the 11th notch shows so much greater live steam pressure, does that properly represent the economical results that ought to be obtained?

Prof. GOSS: I request that Mr. Barr take the one immediately below, at 60 miles an hour. There was a difference there in valve back pressure of 15 lbs.; but in the cards immediately below the valve back pressure was the same. That would illustrate the matter with greater force.

Mr. QUEREAU: If the diagram shows that the Allen valve admits more steam into the cylinder, there is more steam to get out; and, therefore, if the exhaust passages are not large enough to get the steam out admitted by the Allen valve, there must be a greater back pressure for that valve; but if the exhaust port is large enough to exhaust the added steam admitted by the valve, then the back pressure should be the same with the Allen and plain valves. This is frequently true.

Mr. BARR: If we could get the steam out of the Allen valve, it would stand differently from what it does. It is the question of getting the steam out and getting rid of the back pressure, which seems to nullify the advantages of the Allen valve.

MR. HENDERSON: On page 16, it will be seen that the valve E with the Allen valve is considerably higher than with the plain valve. In the 11th notch at 50 miles per hour, there is 14 per cent.; in the 11th notch at 60 miles per hour there is 21 per cent. mean effective pressure in favor of the Allen valve. While there is some back pressure there, owing to to there being more steam in the cylinder, yet that is more than made up by the height of the expansion line.

Mr. HERR: I have recently made some tests with valves, and in the engine that I was experimenting with, we found it very difficult indeed to keep the diagram made by one end of the stroke equal with the other. In taking off the indicator cards and investigating this, we found it due to the springing of the parts, although the cut-off should cut off at just the same point when you are using this plain valve—due to perhaps a little different position of the seat of the valve, friction may be slightly increased, and it gives a very great difference in the port opening and a consequent difference in the area.

Mr. VAUCLAIN: The diagram on the right side, taken by the Allen valve, is much heavier than that taken by the plain valve, whereas the left-hand diagram is in some cases exactly the same size. Might it not be that the false valve seat, which I understand was used, moved when the valve was traveling over it, and thus effected the introduction of steam into the cylinders. I do not see any mention made of the consumption per horse power of the two diagrams; whether the greater back pressure in most of the diagrams taken from the Allen valve would have any effect upon that. It has been my experience with Allen valves that the trouble has been the rapid increase of lead, and the difficulty of getting the steam out of the cylinders, after it has once gotten in. There is no doubt an advantage in short cut-offs and complete expansion of steam, but that short cut-off can be carried to an extreme; that is, the travel of the valve is so short that the point of cut off is less than one-quarter of the stroke; and it has been my experience if we leave the point of cut-off one-quarter of the stroke that the water rate per horse power rises very rapidly.

Mr. SINCLAIR: The Allen valve is the right valve for high piston speed and short cut-offs. The diagrams would appear to sustain that view; for the higher speeds it gives a superior initial pressure over the plain valve and a low terminal pressure. You thus get the two elements that are calculated to use steam economically. I judge from the appearance of the diagrams that the water used per horse power would be considerably less with the Allen valve than with the plain valve; and, therefore, I think the teaching of the experiments is, that in its own place, high speeds and short cut-offs, the Allen valve is superior to the plain valve. The diagrams would appear to show that for a long cut-off there is not much difference.

Mr. VAUCLAIN: For the diagrams taken in the 15th notch, at the various speeds, you will find that the left-hand diagram is slightly better than the right hand. There is very little difference at 10 miles per hour, but there is a supposed advantage there of 21 per cent. At a speed of 20 miles per hour you will notice the right-hand diagram is increased, and you have a difference in favor of the Allen valve of 26 per cent. In the third diagram you will notice at a speed of 30 miles per hour that the left-hand diagram is about the same for the Allen valve, and slightly better than for the plain valve; whereas the right-hand diagram is out of proportion almost double, giving an advantage of 66 per cent., and so on, until we get up to a speed of 50 miles and hour, where we reach an advantage of 71 per cent. in the diagram on the right-hand side with the Allen valve, over that of the one with the plain valve. It seems to me that there must be something wrong with the diagrams. It cannot follow that if these diagrams were taken from a locomotive with the same valve, almost exactly, we would find this great variation only on the one side of the piston, on the right-hand diagram. If the variation was due entirely to the Allen valve, we would see an equal increase of power on the diagrams, taken from both sides of the piston.

Mr. GOSS: Inasmuch as the cut-off is different for the two ends, and inasmuch as the advantage of the Allen valve in increasing the size of the card varies with the different cut-offs, we have ground for explaining the difference in the two ends of the cards.

Mr. VAUCLAIN: Do I understand that at 15 in. the cut off is the same for all speeds?

Prof. GOSS: Yes, sir.

Mr. VAUCLAIN: Therefore, if the cut-off is the same for all speeds, should the cut-off have any effect on the increase of volume of steam admitted at the high or low speed? Would it not, then, be due to the velocity of the steam passing through the passages and the contraction of these passages?

Prof. GOSS: Let me answer that in this way: Suppose the cut-off is 50 per cent. more at one end than at the other. There is not a difference of 50 per cent., but we will assume we have that. The Allen valve has its effect for the shorter cut-offs; its effect is more pronounced proportionally for the short cut offs than for the long.

Mr. VAUCLAIN: I do not think you exactly understand the point I want to make. For instance, at the back end of the cylinder suppose the cut-off is 3 in., and forward end 6 in., or vice versa, if the same relation would remain throughout for any speed, so long as it was in the 15 notch.

Prof. GOSS: For the purposes of argument we will admit that for the present.

Mr. HENDERSON: We have said the Allen valve is not intended for slow speeds, and its percentages come in for high speeds. It shows all the way through you get the advantage increased with the speed.

Mr. VAUCLAIN: No matter how much you have, if the point of cut-off is the same, then the variation in the diagrams for the various speeds that you have recorded should be equal for both diagrams taken; that is, if you increase the speed to 50 miles an hour from 10 miles an hour, it should not necessarily give you two-thirds of the power at the front end of the cylinder and only one-third at the back; whereas, with 10 miles an hour, there is two-thirds at the back and one-third at the front.

PROF. GOSS: I think the fact that the cut-off is not the same for the two ends may account for a proportional difference in the effect of the Allen cut-off. I have only seen the paper in its present shape this morning. There are many difficulties incident to a matter of this kind. It is said that the reverse lever in a certain position should have the same cut-off, but we do not have that condition. With the same speed a difference of lubrication, even, will vary the steam distribution; and as the speed changes the inertia of the moving parts comes in to make considerable difference, and these differences are all proportionally greater for the shorter cut-offs.

I have made a series of tests at speeds of 15, 25, 35, 45 and 55 miles per hour. We should expect that the mean effective pressure would gradually recede as the speed goes up. We did not find it so. We find there is a certain loss of mean effective pressure in changing from a speed of 15 to 25; there is a certain loss, proportionally about the same from 25 to 35; but when the change goes from 35 to 45, there is very little loss of M. E. P., showing that the inertia of the moving parts has a considerable effect on the steam distribution, the amount which the valve moves and the time when it moves. I have some results here giving the steam consumption per horse power per hour for an engine working at 130 pounds steam pressure, full throttle, for 6 and 8 inch.

At 15	miles.	6	in.	28.9	lbs.	steam	per	horse	power per hour.
" 15	"	8	"	27.6	"	"	"	"	"
" 25	"	6	"	28.0	"	"	"	"	"
" 25	"	8	"	26.6	"	"	"	"	"
" 35	"	6	"	29.9	"	"	"	"	"
" 35	"	8	"	26 3	"	"	"	"	"

As the speed increases, it changes.

At 45	miles.	6	in.	28.6	lbs.	steam	per	horse	power per hour.
" 45	"	8	"	28.6	"	"	"	"	"
" 55	"	6	"	30.6	"	"	"	"	"
" 55	"	8	"	32.0	"	"	"	"	"

We get practically the same results with the eight inch as with the six inch; but as we increase the cut-off beyond eight inches, the consumption goes up.

Mr. HERR: I can corroborate the statement of Prof. Goss in regard to the difficulty of duplicating results when apparently all the conditions are the same. I have taken a notch, and run it with a quarter throttle, at speed of 35 miles, and obtained a certain mean effective pressure, and simply by opening the throttle full have cut the mean effective pressure in two. What did that was not what Mr. Lewis suggested, the springing of the eccentric rods. When the valve pressure came upon the valve, there was not sufficient spring to reduce the port openings. It was unequal, and it is always greatest on the end where the card spring can be put into the eccentric rod, where it comes into compression. I still think there is some difference in the friction of these two valves, or at least in the power required to move these two valves, which caused the difference in the mean effective pressure on the different ends of the Allen valve.

Mr. VAUCLAIN: It is hard to believe the variation is due to the Allen valve. We will not be any nearer a solution of the matter if we discuss it all day; and I move the matter be closed.

Carried.

The meeting then adjourned until Tuesday morning.

TUESDAY'S MEETING.

President BLACKALL called the meeting to order at 9:20 a. m. Messrs. W. H. Lewis (C., B. & Q.), G. R. Hender-

son and H. D. Gordon were appointed the Committee on Resolutions.

Reciprocating Parts.—Mr. H. D. Gordon read the report of the Committee on Reciprocating Parts.

RECIPROCATING PARTS.

(The committee on this subject consisted of Messrs. H. D. Gordon, C. F. Thomas, C. J. Turner, T. J. Lawes and John A. Hill.)

The committee considered in detail the possibilities of reducing the weights of reciprocating parts. They took up first the subject of pistons and the report shows various forms designed for solid cast steel or forged steel, and also a very interesting design for a piston of malleable iron made by the Norfolk & Western, also a malleable iron piston from the South Carolina & Georgia Railroad. With steel pistons, of course, special problems arise as to bearing surface and packing. The engravings published in the report of the committee show how these problems have been met by various designers. We shall consider this part of the report more at length in a later issue.

The committee deals next with piston rods. Various investigators have in mind the use of hollow piston rods, and the Schenectady Locomotive Works report that their latest practice is to make the ends or fits larger than the body of the rod, permitting them to make the rod lighter. The committee adds that this practice in connection with the hollow rod would give the lightest possible form. Mr. Herr writes that he is looking up the matter of hollow piston rods with a view to trying the same.

The committee then considers the matter of crossheads and shows several examples, one from the Schenectady Locomotive works, which weighs 158 lbs., and has been successfully used in passenger engines with 19-in. cylinders and 190 lbs. boiler pressure. Another is the crosshead of the Pennsylvania Class L high-speed engines. This weighs 146 lbs. Another weighing 150 lbs. is from the Norfolk & Western railroad. A design for freight engines is of the Laird type from the Rogers Locomotive Works. The crosshead of the Pennsylvania new type mogul for fast-freight work is shown. The compound locomotives of this type carry 235 lbs. boiler pressure, the simple 180. The cylinders of the former are 20 in. and 30 in. diameter; of the latter, 19 in., the crossheads of cast steel and weigh 296 lbs.

The committee is of the opinion that main rods of steel made to I section would give the greatest practical reduction and weight of reciprocating parts. The main rod of the Pennsylvania Class L is shown as illustrating this type. The following table from the Pennsylvania Railroad shows comparative weights of the parts of two passenger engines, "P" and "L" and two freight engines, "R" and the new fast mogul:

PENNSYLVANIA R. R.—COMPARISON OF WEIGHTS OF RECIPROCATING PARTS.

Class of Engine.	"P."	"L."	"R."	Mogul.
	Lbs.	Lbs.	Lbs.	Lbs.
Main rod, front end	144½	121	171	104½
Crosshead, complete	174	146	277	269
Piston and rod, complete	310	269½	368	324
Total reciprocating wt.	628½	536½	816	697½
Total piston pressure	43,008	49,729	43,982	58,123
Piston pressure per lb. of reciprocating wt.	68.4	92.7	53.9	83.3

Mr F. W. Webb, Locomotive Superintendent of the London & North Western, and Mr. W. Worsdell, Locomotive Superintendent of the North Eastern, of England, have furnished your committee with information regarding the reciprocating weights of some of their standard locomotives, and which is given in the tables:

Mr. J. A. F. Aspinall, Chief Mechanical Engineer of the Lancashire & Yorkshire, also sends the following details regarding weights of parts of three classes of engines on that road that are interchangeable.

LANCASHIRE & YORKSHIRE RAILWAY—PARTICULARS OF STANDARD ENGINES' RECIPROCATING PARTS.

	Bogie pass. eng.	Goods eng.	Radial tank eng.
Driving wheels	87 in. dia.	61 in. dia.	68 in. dia.
Cylinders, diameter	18 "	18 "	17½ "
" stroke	24 "	24 "	24 "

WEIGHT OF RECPOCATING PARTS WHICH ARE INTERCHANGEABLE WITH EACH OTHER.

1—Piston head	144 lbs.	
2—Piston rings	10½ "	
1—Piston rod	93 "	
1—Piston rod nut	7 "	
1—Piston rod cotter	¼ "	piston and rod, 254¾ lbs.
1—Crosshead	67 "	
1—Crosshead cotter	3½ "	
1—Gudgeon pin	17 "	
2—Slide blocks	62 "	crosshead, 149 lbs.
1—Connecting rod complete	476 "	
Total	810 lbs.	

Mr. J. F. McIntosh, Locomotive Superintendent of the Caledonian Railway of Scotland, sends list of weights of the reciprocating parts of the last new engine built for that line, cylinders 18¼ in. diameter, driving wheels 78 in. diameter:

	Lbs.
Weight piston and rings	144
" piston rod and crosshead	126
" piston rod, nut and pin	9
" crosshead pin	21
" slide blocks	47
" connecting rod	471
Total	818

Mr. HENDERSON: As the Norfolk & Western piston is referred to, it may be interesting to speak about it. We think it is an advantage over other forms, but we had in mind to use the same cylinder heads that had been previously used with the cast-iron pistons, and to avoid all protuberances, which come with single-plate pistons. We have a non-conducting air space which, instead of permitting the ready transmission of heat from the steam side to the exhaust side, acts as a medium to retard the transmission and we have the cast-iron wearing ring. We have only had them running two months.

Mr. SOULE: We preferred this form of box piston, so that we not only avoid a construction which would require the use of dished cylinder heads, but we wanted a light piston which we could put in any cylinder. We wanted to take up systematically the counterbalancing of the locomotives, but before beginning on the crosshead we wanted to get light pistons, so that as the engines came through the shops for repairs, and needed to have the piston renewed, we might introduce the lighter piston and proceed to counterbalance the engine on the basis of reduced weights.

Mr. FORNEY: Something is said in the report in relation to the rough surface of the pistons. In Europe they have found considerable advantage from turning and polishing the surface of the piston and cylinder heads, so as to lessen the amount of surface condensation.

Mr. HERR: Have any of the members had any experience with hollow piston rods?

Mr. HENDERSON: It was probably a year ago that we bored a hole through a piston rod, with an extension, the whole rod being six feet long. The hole was 1⅝ or 2 inches, directly through the rod, with the idea of decreasing the weight of the reciprocating parts. The only thing we know about it is that it has been running satisfactorily.

Mr. GORDON: It is rather a difficult matter to drill a hole as long as the piston rod, and the amount of material saved is hardly worth the while taken to bore the hole.

Mr. THOMAS: Our manner of making the piston head (Southern Railway) was to use the cast-steel T form as shown in the report of the Committee on Pistons the year before last, I think; turning down the cast steel, leaving a central flange, finishing up all parts ready for the rod, and then flatting in the sand, and casting the metal round by fusing the metals, the same process as fitting up car wheels with steel tires. In the matter of the crosshead, that was designed in place of the H head; it was found in the H head we had an excessive weight, and also there was more or less trouble with the crosshead key and its piston rod fastening. I changed the design, cutting a slot in the head between the pin fit for the main rod and piston, casting the shoe on with the head, making a considerable difference in weight. The old H head was designed on the Pennsylvania style, aggregating 285 pounds. We reduced that to about 160.

Cylinder Bushings.—Mr. Barr then read the report of the Committee on Cylinder Bushings.

CYLINDER BUSHING.

(The committee on this subject consisted of Messrs. T. N. Barr, J. H. McConnell, John S. Chambers, Geo. F. Wilson and W. H. Marshall.)

The committee sent a circular of inquiry to the members of the association, to which twenty-four replies were received. The table attached gives a résumé of the replies. In all cases the experience in the use of bushed cylinders has been entirely satisfactory.

The columns headed to be used "in case of," with the sub-columns "over-cylindered engines," "worn cylinders," "cracked cylinders," "cylinders soft" and "new cylinders," represent the opinion, as far as it could be obtained from the reports, of the cases in which it is desirable to use bushings.

Three ways of constructing the bushing are considered. A large number of those reporting favor the bushing extending from the front head to the back head. Several members recommend the bushing terminating at the inside of the port of the back head. One member proposed a construction in which a collar in the front end of the bushing is formed to bear the pressure of the front head, and to avoid the necessity of bridging the port.

Those recommending the use of bushings for new cylinders do so on the following considerations: The qualities required in a cylinder casting are especially strength and toughness. These two qualities are, however, inconsistent with the hardness that is necessary to secure a good, smooth polish in the bore of the cylinder. In the attempt to obtain a good wearing surface in the cylinder, the casting has a tendency to become of such a character as is liable to crack in service.

By the use of an independant bushing, a perfectly clean casting of uniform density throughout, and of such a hardness as will give the best results as to wear, can be obtained without in any manner influencing the quality of the material in the body of the cylinder.

A number of the members have called attention to the trouble arising from the cylinder being soft, especially with reference to rapid wear and necessity for frequent reboring of the same. Some of the committee are of the opinion that frictional resistance between the cylinder and piston consumes a large amount of power, and any means which will reduce this resistance is likely to produce a freer working engine, and one more economical in consumption of fuel and oil.

NORTH EASTERN—WEIGHTS OF RECIPROCATING PARTS.

Class.	Class Letter.	Driving wheels. Diam.	Driving wheels. Number coupled.	Cylinders. Diam.	Cylinders. Stroke.	Valve gear.	Pistons and rods.	Cros head gudgeon and slide block.	Main rod.	Total, one cylinder.	Remarks.
		In.		In.	In.		Lbs.	Lbs.	Lbs.	Lbs.	
Passenger.	A.	66	4	18	24	Joy's	234	205	401	840	Loose crosshead cottered to rod. Two loose slide blocks.
"	F. F. 1	78	4	18	24	"	244	205	442	891	
"	J.	90	None.	20	24	"	364	131	453	948	Crosshead forged in one piece with piston rod, and weighed therewith Two loose slide blocks.
"	M. 1	84	4	19	26	Eccentric	339	131	446	916	
"	M.	84	4	20	26	"	364	131	446	941	
Goods	C. C. 1	60	6	18	24	Joy's	234	222	437	893	Cast-steel crosshead working on single guide bar.
"	P.	54	6	18	24	Eccentric	234	222	383	839	
Passenger.	F.	78	4	26	24	Joy's	392	205	442	1,039	Low-pressure side of compound engine—the piston rod is extended through front cover.
"	J.	90	None.	28	24	"	462	131	453	1.146	
"	M.	84	4	28	26	Eccentric	567	131	446	1,144	
Goods	C.	60	6	26	24	Joy's	382	222	437	1,041	

Some members of the committee are decidedly of the opinion that the advantages gained by using a bushing harder than it is possible to obtain in the ordinary cylinder casting effect a decided economy in the above respects.

In this connection the committee calls attention to the matter of false valve seats. If these are made separately, they can be made much harder than the ordinary solid seat. The false seats are now constructed in such a way as to give practically no trouble, and with the adoption of the false valve seats, and a cylinder bushing of the proper hardness, the entire wearing parts of the cylinder would be fully provided for, and the failure of the cylinder would simply depend on its power of resisting the strains to which the body is subjected in service

In the operation of fitting and bushing the cylinder, the majority report turning the bushing to practically the same diameter as the fit in the cylinder.

SUMMARY OF REPLIES TO CIRCULAR ON CYLINDER BUSHINGS.

	Number of engines equipped with bushings.	Thickness of bushings.	Port bridges.	To be used in case of: Over-cylindered engines.	Worn cylinders.	Cracked cylinders.	Cylinders too soft	New cylinders.
C. M. & St. Paul	59	½	1	x	x	x	x	x
Penna Co.	93	⅞ to 1 1/16	....	x	....	x	....	....
A., T. & S. F.	50	½	1	x	x	x	.....	....
C. N. W.	50	.....	....	x	x	x	x	x
C & A.	25	.....	....	x	x	.....	....	....
C., C., C. & St. L.	20	⅝	2	x	x	.....	x	....
P. & W.	12	⅛	2	.....	x	.....	.....	....
M. & St. L.	10	⅝	....	....	x	.....	....	....
M. & W.	10	.....	....	x	....	.....	....	....
St. L. & S. W.	7	½	3	.....	x	x	.....	....
Can. Pac.	7	½	1	.....	x	x	.....	....
C. & St. L.	6	½	....	....	x	....	....	....
Northern Pac.	6	.....	....	x	.....	.....	.....	....
Beech Creek	5	⅝	....	.....	....	x	.....	....
B. C. R. & N.	5	⅛	..	.....	x	x	.....	....
T. H. I.	4	.....	....	....	x	x	.....	....
U. P.	3	1	1	x	.....	.....	.....	....
C. R. & I.	3	¾	1	x	x	x	.....	....
D. S. S. & A.	2	¾	....	x	....	x	.....	....
D. R. & C.	2	.....	1	.....	....	x	.....	....
B. H. & C.	2	⅝	....	....	x	.....	.....	....
Old Colony	2	.....	....	x	.....	.....	.....	....
C. R. R. of N. J.	1	1/32	....	x	x	.... ..	.....	....
S. A. & A. P.	1	.....	....	.....	x	.....	x	....

In conclusion, the committee summarizes as follows:

First. That cylinder bushings ¼ in. to ¾ in. in thickness will meet all requirements.

LONDON & NORTH WESTERN.—WEIGHTS OF RECIPROCATING PARTS.

Class of engine.	Size of cylinders. Diameter.	Size of cylinders. Stroke.	Diameter of wheel with 3-in tire.	Weights of different parts. Piston and rod.	Crosshead.	Connecting rod. Reciprocating.	Connecting rod. Revolving.	Connecting rod. Total.	Total reciprocating weight.
	In.	In.	In.	Lbs.	Lbs.	Lbs.	Lbs.	Lbs.	Lbs.
7-ft. compound engine (8-wheeled)	H. P., 15	24	85	161	158	117	225	342	426
"Greater Britain" class	L. P., 30	24		441	179	113	343	456	733
7-ft. compound engine (6-wheeled)	H. P., 14	24	85	160	138	117	225	342	415
"Teutonic" class	L. P., 30	24		488	179	113	343	456	780
6-ft. compound engine (6-wheeled)	H. P., 14	24	75	156	138	117	225	342	411
"Dreadnought" class	L. P., 30	24		441	179	113	343	456	733
6 ft. 6 in. four wheels, coupled passenger engine	17	24	81	191	71	122	242	364	384
4 ft. 6 in. four wheels coupled, side tank passenger engine	17	24	56½	185	71	122	242	364	378
Six wheels coupled. Goods engine	18	24	62½	234	130	97	325	422	461
4 ft. 3 in. eight wheels coupled	H. P., 15	24	53½	156	224	77	191	268	457
Compound Goods engine	L. P., 30	24		441	179	156	376	522	776
4. ft. 3. in. six wheels coupled, Goods engine	17	24	53½	191	71	122	242	364	384

NOTE.—All weights are for one cylinder only.

Second. The bushing should be turned to the same diameter as the cylinder fit.

Third. Bushings fitted without any fastenings except the pressure of the heads will give perfectly satisfactory results.

Fourth. The use of bushings is a practical method of reducing the bore of cylinders, of repairing cracked and worn cylinders, and avoiding the difficulty of cylinders which are too soft.

Fifth. The question of fuel and air economy, which

may be obtained by the use of hard, homogeneous bushings, is one which should receive careful attention.

Mr. HENDERSON: I believe that the proper way is to make cylinders with bushings. You can then maintain them at the proper size; you can easily renew them, and the whole thing suggests that it is a proper mechanical arrangement.

Mr. MILLER: While there are conditions which may justify the use of false seats, and the use of bushings, in the general run of locomotive work it should not be necessary to use them. I believe in proper packing, proper material in cylinders to start with, and the valves properly balanced. There is no reason why either cylinders or valve seats should wear so as to make it necessary for false seats or bushings.

Mr. VAUCLAIN: I agree with Mr. Barr that it is an easy matter to bush our cylinders, and also to have false valve seats: but it costs money. I agree with Mr. Miller, if the cylinders are made out of the proper material to start with, and modern plans of packing are used, there is no necessity for it.

Mr. GENTRY: One of the largest and best-known locomotive-manufacturing companies furnished us with some consolidation engines. The cylinders wore in a short time, and we bored them out and bushed them. A number of the bushings have made over 100,000 miles without boring, and we could not get more than 20,000 miles out of the cylinder before boring. I have never advocated the bushing of new cylinders.

Mr. QUAYLE: As shown by this report, the Northwestern bush their new cylinders. We have some Baldwin engines which have been on the road for 30 years, and the cylinders were never bushed. We got some other engines of the Baldwin make five years ago and the cylinders had to be bushed. The old condition was that all the small cylinders used to wear on the bottom. The larger cylinders, with higher steam pressure, wear rapidly on the top; the cylinders were not properly cored. In order to overcome the irregularity in the mixing of the metal, we concluded to use steel iron, with perhaps 10 to 30 per cent. of boiler plate mixed with the iron in order to give a better iron; more homogeneous and better wearing qualities. We experimented with the bushing and it gave excellent results. I am of the opinion that some day we will come to use steel cylinders and make them lighter. Our experience with the steel iron for false valve seats and steel bushings has given us most excellent results.

Mr. MACKENZIE: We have engines with over 300,000 miles, and run 300 miles every day without facing the valves. There may not be good iron put in cylinders and valve seats, and that is where most of the trouble lies.

MR. BARR: I would like to know some formula from the foundrymen that will enable me to secure the toughness that is necessary for the heavy pressure and hard work to which a locomotive is subjected to-day, so as to guarantee against the cracking of the cylinders at the saddle. I have had a good deal of experience in foundry work, and the trouble in casting cylinders is how to get them that they will not break, without getting the cylinders so soft that they would wear, and the wear, in my opinion, is the principal objection in this matter. We have changed the performance of an engine on a somewhat carefully run record, reducing the fuel consumption nearly 20 per cent., by bushing the cylinders, and not changing the diameter, either. These cylinders were so very soft that they would not polish, and the steam required to force that piston back and forth, over that unsuitable surface, apparently consumed 20 per cent. of the power of the engine. With a cylinder bushed, a plain tube of cast iron, you can put in just the kind of iron desired; the only thing necessary is to get a hard, solid cast iron that will polish and produce good results so far as friction is concerned. I feel satisfied that one year in the use of such bushing will pay, in the matter of coal, the expense of putting in the bushing ten times over. I do not think there is any place where we will get more money out of railroad practice than toughness in the tube and hardness on the wearing surfaces of cylinders of locomotives.

Mr. LEEDS: I do not think that it is necessary to make a soft iron in order to make a strong iron. It seems to me that Mr. Vauclain is right in saying that we should put on future generations the expense, at least, of our repairs. When we take the proper grade of strength for our cylinders the addition of $\frac{3}{8}$ of an inch for wear is equivalent to $\frac{5}{8}$ of an inch for bushing. I think it is good policy to make a cylinder strong enough and close grained enough so that it will glaze and wear to good advantage.

Mr. HERR: We have had some experience with bushing cylinders, not only bushing over-cylinder engines down to smaller sizes, but bushing new cylinders and fitting up new valve seats on cylinders from the locomotive shop. In answer to the question of economy I will say that it has, in my experience, produced quite a decided economy in fuel consumption to bush down an over-cylindered engine. The reason seems to me apparent, because it enables the boiler to perform its work more uniformly with less forcing at intervals, and consequent destruction of its economy. There is no doubt if we could get cylinders that combine at the same time requisite strength and wearing qualities, it would be folly to bush them. It seems difficult to obtain the proper material to produce good wearing qualities and at the same time give the necessary strength. In our experience with 50 bushed cylinders, 24 on new engines, the results are satisfactory to bushing.

Mr. GENTRY: The conditions under which we bush our cylinders are just such conditions as every man in charge of a medium size repair shop to day is compelled to meet. You buy some new engines. One engine has a soft cylinder or valve seat and commences to wear. Under these conditions it is cheaper with the average repair shop to bore out a cylinder and slip in a hard bushing than it is to take off the cylinder. I can do it in as many hours as it would take days to do the other job.

Mr. THOMAS: I have had considerable experience in bushing cylinders, as I bushed over 40 engines. The question of the cylinder cost does not come in so much, but the question of the use of the engine when you are limited for power.

Mr. VAUCLAIN: I think the meat in this matter is this: that the point Mr. Barr makes in regard to bushing new cylinders is the only point. In making a cylinder casting of good soft tough material it pays to bush the cylinders, if in this manner you can prevent breakages; otherwise it will not pay to bush them when they are new. There is no question about bushing old cylinders. The point is whether we shall bush new cylinders. There will be enough bushing done in the future on the various roads so that in the course of a few years we will be able to determine whether the softer cylinder castings will prevent the breakages in the saddles and flanges. The difficulty in making hard cylinders is to prevent shrinkage cracks, and it is a constant study to arrange and shape the pattern so that we can avoid these defects. The softer the iron the less liability to defects of that sort, and we would be more likely to get a casting free from shrinkage cracks.

Hub Liners.—Mr. R. H. Soule read the report of the committee on hub liners:

HUB LINERS.

(The Committee appointed on Hub Liners consisted of R. H. Soule, Mord. Roberts, W. T. Reed, A. J. Cromwell and F. B. Miles.)

The investigations of the committee show that the use of hub liners is quite general, both on the driving wheels and the truck wheels of locomotives, and that they may be divided into three groups as regards their general features of design.

The first group comprises those which are simply metallic discs attached to the faced surface of hub of wheel. The second group comprises those which consist of metallic discs formed with a stiffening rib on one face; this rib entering into a corresponding groove in hub of wheel and the whole attached to the faced surface of hub of wheel. The third group comprises those which consist of metallic discs formed with a dovetailed rib on one side, this rib filling a similar dovetailed groove which is formed in the hub of the wheel, the whole attached to the faced hub of the wheel.

Liners belonging to both the first and second groups are made separately, and subsequently attached to the hub of the wheel, while those of the third group must necessarily be cast in place.

A few roads use no liners on hubs of wheels, but do use liners on wearing faces of driving boxes and truck boxes, while another group of roads combines these two practices and uses, to some extent, liners on both hubs of wheels and both the wearing faces of boxes. The liners applied to driving or truck boxes are invariably thin discs of metal, usually of brass or bronze, and attached by screws or by taper plugs subsequently riveted down to a finish surface; the only exception is when the wearing face of box is coated with white metal which is sweated on to the surface; this practice has been very extensively followed by the London & Northwestern, which road has used cast-steel boxes very largely. Very few roads, however, make any extensive use of liners on the wearing faces of truck boxes, the reason being that it is usually found to be cheaper to renew the truck box casting (using the old brass and cellar over again) than to remove an old liner and apply a new one.

Most of the roads use liners of cast iron, while a smaller number use brass or bronze, and one or two roads use wrought iron.

About half of the roads reporting are of the opinion that it would be good practice to apply uniform interchangeable hub liners to all the wheels of all the new engines, and also to all new wheels introduced under old engines; the other half are of the opinion that the application of hub liners to new wheels cannot be justified and ought to be deferred until the original surfaces have become so abraded and worn that it is necessary to do something to take up the lateral motion. There is no doubt, however, that hub liners should be applied to cast-steel wheel centers at the outset and before wheels with such centers are put in service.

The committee, after reviewing and considering the existing practice on roads represented in the Association, submitted the following opinion:

First. That if a good system of interchange hub liners is in use it is unnecessary to make use of box liners.

Second. That cast iron is sufficiently good material for hub liners, and that the use of brass or bronze is unnecessary.

Third. That the application of hub liners to all the wheels of new engines, and to all wheels introduced under old engines, is good practice.

Fourth. That the use of loose liners, riding on axle between wheel hub and box, is not good practice.

Mr. ATKINSON: I do not see any mention in the report of the use of babbitt for hub mining. We have made a practice for three or four years of babbitting the driving wheel hubs and truck-wheel hubs. It wears less than any other metal we put on and is more easily replaced; we have tried bronze and other things, but nothing is as good as babbitt.

Mr. MCCONNELL: It has been our practice for the last 18 months to use babbitt on the side of the driving boxes and truck boxes. The face side of the box is bored out and lined with $\frac{3}{8}$ in. thick of babbitt, which is planed off when the box is planed off. An engine lately run 40,000 miles and only accumulated $\frac{1}{16}$ in. lost motion on the back driving box between the hubs. In our old driving box we bored them out under a lathe and filled them with babbitt with excellent results, and there was no wear on the truck wheels or driving wheels from the babbitt. We babbitt all our eccentric straps on the face and have reduced the number of broken eccentric straps 60 per cent. in the last two years by the use of babbitt.

Mr. GIBBS: We experimented four years ago babbitting the face of driving box, and finally adopted that practice as standard. We turned the faces with the groove and dove-tail, which gives us $\frac{1}{8}$ in. thickness of genuine babbitt on the flange part and the dove-tail being about $\frac{1}{2}$ in. more. In that way we get a cheap method of securing the babbitt and improve both working services materially. The results have been excellent.

Mr. THOMAS: It has been my practice for the last eight years to use block tin. In applying this tin if it is a shell box, the brass or shell is soldered to the surface of the box to prevent its being knocked loose. It is then tinned evenly with the solder with the usual soldering iron and acid, and it is then covered with the melted tin.

Mr. HERR: The practice of the Chicago & Northwestern road is the same, as I understand, as is given for the Milwaukee & St. Paul. We put genuine babbitt on the face of the driving box, but use no hub liners except on cast-steel wheel centers.

Mr. SOULE: Relating to the question whether it is good practice to always apply hub liners to all the wheels of new engines, and in new wheels introduced under old engines, a majority of the committee favored that practice. I think perhaps that is the most doubtful question of all.

Mr. VAUCLAIN: I am disposed to agree with the committee which made this report. I think it would be wise for railroad companies to have all their locomotives when built new fitted with hub liners.

Mr. THOMAS: I am of the opinion that hub liners should be avoided in all cases where it is possible. We have all been working to get a longer journal bearing. We have cut down our wheel hub to give a longer bearing, but to put in a liner we reduce the space on the axle.

Mr. JOUGHINS: It seems to me from the opinions given here that a very large part of this question depends upon the friction between the different metals which we may put on the hub liner and on the axle box, and I would move that this committee be continued for another year with the object particularly of finding out what are the best methods to line the hubs of the wheels and the faces of the boxes, no matter of what material they may be originally constructed.

Carried.

Steam-Pipe Joints.—Mr. Gibbs read the report of the Committe on Steam Pipe Joints.

STEAM PIPE JOINTS.

(The committee appointed to report upon steam pipe joints consisted of George Gibbs, E. A. Williams, John Hickey, J. J. Ellis and John Y. Smith.)

A circular of inquiry brought 32 replies, containing information which was grouped under the following headings:

First. Material of steam and exhaust pipes. Second. Material and manner of making up joints. Third. Shape of pipes. Fourth. Manner of securing joints. Fifth. Experience with joints used. Sixth. Suggestions of improvement of service.

First.—It appears to be the uniform modern practice to use cast iron for both steam and exhaust pipes. Two roads have lately made experiments with wrought and malleable iron, and the results were satisfactory, except in the matter of first cost. These pipes were made as thin as was consistent with strength, and it was claimed that the resulting elasticity relieved the strains on joint-bolts, and thus lessened the number of leaky joints.

Second.—The use of brass rings seemed almost universal for top and bottom steam-pipe joints, the general shape being plano-convex. One member prefers cast-iron rings, another reports using copper wire gaskets between the joint faces.

Third.—Although formerly it was usual to make steam pipes straight this has been abandoned and the present practice is to curve the pipes so as to fit approximately to the interior of the smoke arch. The pipes are made roughly elliptical in section, which gives them flexibility and secures best access to flues.

Fourth.—Steam pipes are usually secured by two bolts or studs top and bottom, which pass through cast flanges on the pipes, tee-head and saddle. This is shown in Fig. 1.

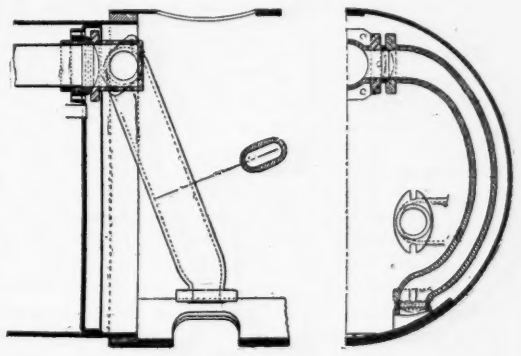


Fig. 1.

Although this method has been reported by many members to be satisfactory, there are many others who report increasing trouble with loose joints, and their opinions, based on the results of experiments, seem to be that more joints should be used, preferably four top and bottom.

Good practice condemns joint faces set at an angle with the vertical and horizontal planes through the axis of the dry-pipe. The general approved method is shown in the figures accompanying this report.

Fifth.—In general, the members find very little fault with the present form of pipe joints in locomotive front ends, and this feeling may also be said to exist throughout the country.

(*Continued on Page 474.*)

RAILROAD GAZETTE

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EDITORIAL ANNOUNCEMENTS.

Contributions.—*Subscribers and others will materially assist us in making our news accurate and complete if they will send us early information of events which take place under their observation, such as changes in railroad officers, organizations and changes of companies in their management, particulars as to the business of the letting, progress and completion of contracts for new works or important improvements of old ones, experiments in the construction of roads and machinery and railroads, and suggestions as to its improvement. Discussions of subjects pertaining to* ALL DEPARTMENTS *of railroad business by men practically acquainted with them are especially desired. Officers will oblige us by forwarding early copies of notices of meetings, elections, appointments, and especially annual reports, some notice of all of which will be published.*

Advertisements.—*We wish it distinctly understood that we will entertain no proposition to publish anything in this journal for pay,* EXCEPT IN THE ADVERTISING COLUMNS. *We give in our editorial columns* OUR OWN *opinions, and those only, and in our news columns present only such matter as we consider interesting, and important to our readers. Those who wish to recommend their inventions, machinery, supplies, financial schemes, etc., to our readers, can do so fully in our advertising columns, but it is useless to ask us to recommend them editorially, either for money or in consideration of advertising patronage.*

The Board of Control of the Joint Traffic Association met last Tuesday, and according to the statements of the reporters, Mr. Ingalls, President of the Cleveland, Cincinnati, Chicago & St. Louis, made such a specific complaint against the Toledo, St. Louis & Kansas City that the Presidents voted to instruct the lawyers of the association to see if the road could not be prosecuted for illegal rate-cutting. The Toledo, St. Louis & Kansas City is said to have gained a good deal of eastbound freight from St. Louis by staying out of the association; how much does not appear, but it was reported last week that the Board of Managers of the association had considered, and denied, an application from St. Louis roads in the association for leave to reduce rates to meet the action of this outside competitor. A proposition to prosecute a competitor in the courts, instead of reducing rates with a view to starving him out, is a decided novelty and it must be assumed that Mr. Ingalls has something in the shape of evidence to back up his complaint. A reduction of rates by all of the association lines would of course be a perfectly legitimate method of fighting the "Clover Leaf," and it would seem as though such a combined attack ought to very quickly bring any small or poor road to terms, but the extreme reluctance of the nine managers to make any reduction illustrates the difficulty of proving that such a reduction would be wise. When it comes down to cold dollars and cents, it is profitable to let a weak competitor have a good deal of business before you conclude to sacrifice all of your own profits—a good deal more than the soliciting agents deem it safe to allow him. If the association continues to maintain rates and prosecutes its antagonists in the courts it will find itself working in harmony with the Interstate Commerce Commissioners, who have for nine years been telling the railroads to go to the courts instead of using clubs and pistols. This will be another novelty.

The Receivers of the Northern & Western still refuse to join the Association and it is said that they were as much the subject of acrimonious remarks in Tuesday's meeting as the Clover Leaf. They have reduced rates on westbound freight and do not worry themselves much about the regulations of the Association. They aver that they still work in harmony with it, but they do not seem very anxious to get the opinion of the Board of Managers before making changes in rates. These Receivers, and those of the Clover Leaf too, doubtless feel that they are competing in a new field and that, therefore, they would be taking a great risk in joining an association where they would have to submit their claims to arbitration, for the reason that the arbitrators would have no past records of traffic to guide them to just decisions. To a certain extent this is true. The Norfolk & Western has never really got its bearings as a competitor for business to and from the West under normal conditions. The Clover Leaf has not so good an excuse, but its facilities are said to have been considerably improved within the last few years. In the case of both roads the managers are somewhat new in their offices, another reason for a cautious policy. If, however, the overtures of the Association roads are as liberal and frank as they are reported to be, it would seem as though the best way for the outsiders to show the sincerity of their professions of conservatism would be to reciprocate by frankly advising with the Board of Managers before making changes of rates. The question whether the Canadian Pacific will join the Association is still unsettled. President Van Horne promised to come to New York this week, but at this writing no agreement with him has been reported.

The latest sufferers from high transportation rates are the wholesale spice dealers of New York City. Spices are not exactly a necessary of life, but the importers of nutmegs and cinnamon want rates to Chicago as low as those demanded for crockery and salt codfish by the carload. The chief complaint, however, is concerning rates to New Orleans, and to that city most freight goes by steamer. It appears that the rates are higher than from London direct, and the New Orleans merchants therefore go to London for their spices. We do not see what the Interstate Commerce Commission can do in such a case, and so we can only tell the spice men that we are sorry for them. Competition in transportation by water is the freest in the world and one would think these merchants ought to be happy, but it seems that the cheap transportation of these modern days brings in competitors never before heard of. The boats from New York to New Orleans cannot be compelled to reduce their rates, for they are free to go out of business. Vessels going from London to New Orleans for cotton cannot be compelled to raise their rates, for that would deprive them of the spices and tend to raise the rate on cotton to Europe. The only possible remedy we can think of is to have a Transportation Commission to sit on the ocean, but we fear that that would be even more unsatisfactory than our Interstate Commerce Commission on land; the Commission's authority would be as doubtful as its seat would be insecure, and it would soon get sick of the job. It is to be noted that New Yorkers are only middlemen at best and that the reporter of the *Journal of Commerce*, who publishes these facts, finds some merchants who explain their loss of trade in a more rational manner; London merchants are able to undersell them. On the other hand, New York merchants of exceptional enterprise, who receive shiploads direct from Singapore, undersell London, and for half the year make New York the cheapest market in the world. For the railroads, this sharp competition in a commodity furnishing so little tonnage is of interest chiefly as showing that the theory of charging what the traffic will bear is gradually coming to be mostly a hollow mockery; none of the traffic will bear anything. The socialists and some other cranks want Congress to compel the railroads to carry everything—drygoods and pianos, strawberries and trotting-horses—at the prices now charged for coal and bricks; it looks as though on some of the principal railroads they will get about what they want by the forces of competition, without waiting for Congress to act.

The Apprentice Boy.

At the convention of the Master Mechanics' Association a report was presented which was novel and interesting in the subject and in the matter. This was the report on "the apprentice boy," and perhaps the chief interest in it is in the fact that the Master Mechanics' Association has actually taken hold of this important subject. We venture to contribute a few words to the discussion; not that we have any cut and dried opinion, but because an exhibition of our own want of information and of our immature opinion may encourage others to say something on the subject.

Apprentices in the mechanical department will naturally divide themselves at once into two broad classes. First, the graduates of technical schools, and, second, boys starting with only the rudiments of a common-school education.

Of the first class little need be said. Those young men know pretty definitely what they want and how to get it. Those of their number who have the sense and the patience to take a shop course can almost always find a chance to do so, and can advance fast, but they will not fill the ranks of the journeymen and they ought not to. That would be a waste of stored energy. They can go on to such high offices as their natural abilities and their education fit them for. Some of them would do better to stop in the ranks of the journeymen, but few of them will do so. Moreover, there is little danger that these young men will become communists or strikers; they are already capitalists, their education being their capital. Their efforts will always be directed, consciously or unconsciously, toward maintaining the conditions that give the individual the best chance to rise above the average by his own industry, thrift and ability. They are not likely to combine in efforts to drag workingmen down to one common level, nor are they likely to wage war on the corporations in whose prosperity they know lies the best chance of their own prosperity.

The second much more numerous class is the one to be considered in making a plan for dealing with apprentices. In this class is a small percentage of superior characters. These boys can hope, if they have a chance, to reach almost any rank, but the great mass of them must remain journeymen and can never be anything else. Should the apprentice system be arranged so as to help the superior boys who are too poor to go to technical schools? Or should it be directed simply to making good journeymen? Or can both objects be accomplished by the same system? Possibly the last suggestion is the soundest one. Possibly the system that will make skillful and faithful journeymen will also be the best one to open the avenue by which the select few can go further. At any rate, as the overwhelming majority must be journeymen, the first consideration should be directed to making good journeymen. If we can also at the same time lay the foundation for such an education that the lads of force and talent can go on to be superintendents of motive power, so much the better; but we must not forget that the real end in view is to produce good journeymen. The superintendent of motive power can only be an incidental product of the system.

In laying out our system, it is well at the outset to come back to a great fundamental principle that folks are always talking about and always forgetting. Education is two things, making character and getting knowledge, and of these two things, making character is immensely the more important. Indeed, when we apply this principle to the education of the journeymen we see that character is nine-tenths of what we want.

Fair intelligence must be assumed to start with. Then, given a young man who is sober, ambitious and industrious, who has learned to persist, who has a sense of duty, who respects his superiors and respects himself, and we need not worry much about the rest of his education. The conditions must be hard and unusual if that young man does not learn to be a superior mechanic and indeed fit himself for a foreman, or a shop superintendent, or a superintendent of motive power, or a general manager, according to the limits of his natural ability. Chinese Gordon used to say that Plutarch's Lives were better reading for the young officers than books on minor tactics. Gordon was an able engineer and an accomplished soldier, and he knew well the value of minute and thorough training, but he also knew that a man cannot go far unless the higher faculties of his mind are enlisted His imagination must be aroused; he must have enthusiasm and zeal and devotion if he is to ever be more than a mere machine, doing perfunctory routine work.

On the other hand, if the young man's character is weak or bad, it is a questionable service to him or to society to add to the store of his knowledge of mere facts or methods. The chances are that the increased knowledge will merely make him more discontented with his lot and will make him a loafer, or an agitator, or a semi-criminal or criminal, according to his bent, and according to the conditions which influence him.

It may be said that we have been stating a mere truism. Quite so; and the statement that you cannot lift yourself by your boot straps is also a truism, and a great deal of good energy is wasted by those who forget these mere truisms.

If, then, character is of such vital and overwhelming importance in the journeyman, how can we get it or train it? The first obvious step is careful selection, and we should say that the first principle is to fill your shops with the sons of your own employees. For this there at least two good reasons. First, you know the stock and can choose the boys who by inheritance and example are likely to have good qualities. Second, you also fix in the minds of men and boys the notion that they are part of the company. You are beginning early to make the boys feel that they have a personal interest in the prosperity of the company, and that it has an interest in their welfare. This is the beginning of that feeling of loyalty of which the committee speaks.

Having selected the boys you will naturally try to surround them with good influences and to keep before them ideas and examples which will help in their moral growth. An obvious thing to do and one

which is often practicable, especially in small towns, is for the local railroad officers to take some interest in making the community in which the shops are situated moral and law-abiding. A good many railroad officers exert valuable influence in this way. Another obvious thing to do is to provide a library, reading-room, gymnasium and baths, available for the employees of the shops. This is now done by different companies at different points, often in co-operation with the railroad branch of the Young Men's Christian Association. Another step is to make the shops themselves as decent and comfortable and orderly as possible; and here, fortunately, the direct pecuniary interest of the railroad company is in a line with the moral education of the men. Still another step is for the superintendent of the shops and the foremen to keep close watch of each boy and let the boy know that he is an object of personal interest to his superiors. A great deal can be done in this way to help the boy along in a shop education and to build up his ambition and his self-respect.

All of these things can be done in greater or less degree, without any attempt at night schools or specific education in mathematics or drawing; but it would seem as if an important supplement to the whole system, in any shop that is large enough to warrant it, must be a night school, which all of the apprentices are required to attend. A few such schools have been in existence for a number of years in various shops and we should suppose that many more could be established at small expense, with little difficulty and with certain ultimate gain. The Master Mechanics' Association Committee has some definite suggestions on this point from Purdue University and from the University of Chicago, and in the suggestion of Purdue a course of study is laid out. With this course of study we have no fault to find, except in one particular, which seems very important. We find no mention of any study of physics, but if we were to choose between physics and higher algebra we should say that there would be no question as to the advantage, to the apprentice, of physics. In fact his algebra will be of very little use to him if he is not thoroughly grounded in the fundamental laws of physics. His arithmetic and his algebra can only be useful to him if he can reason correctly, and he certainly cannot reason correctly without a sound knowledge of the principles which underlie the whole science of engineering.

From the experience of the past we should be inclined to warn the man who starts in to carry out any of these specific ideas for the education of apprentices that he must be prepared for a good deal of indifference, not to say sloth, on the part of the apprentices in taking advantage of the opportunities given to them in reading-rooms and night classes; and the success of such enterprises will depend mainly upon the intelligence, the zeal and the persistence of the men behind them.

In September, 1854, we wrote concerning the night schools on the Michigan Central, the experience with which would, doubtless, be useful to anybody who is disposed to consider this subject further. Perhaps we cannot better close this somewhat "theoretical" article than by reprinting the conclusion of that former article.

Finally, even if all our reasoning is wrong, an experiment in this direction is not very costly, and the possibilities of getting valuable results seem so great that we wonder that the experiment is not more often tried. For, after all, the workman can never be deprived of the social and political power that he has won. Labor unions can never be suppressed or even "regulated" without the consent of the men themselves. Whether unions are good or whether they are bad is not the question; they are here to stay until the working man finds some better way of getting what he wants. The only hope is in the growth of intelligence in the working man and in the development of courage and independence in the individual. Slowly and by suffering they will learn that organized society is an affair of compromises, and that the interests and obligation of capital and labor are reciprocal. The final solution of of our troubles is education. "For," says Huxley, "education promotes peace by teaching men the realities of life and the obligations which are involved in the very existence of society; it promotes intellectual development, not only by training the individual intellect, but by sifting out from the masses of ordinary or inferior capacities those which are competent to increase the general welfare by occupying higher positions; and, lastly, it promotes morality and refinement by teaching men to discipline themselves."

It is stated in a Southern newspaper that Railroad Commissioner Wilborn, of South Carolina, is trying to induce the Interstate Commerce Commission to espouse the cause of the watermelon growers of his state. He says: "For the past three or four years watermelon growers have made no money in their business, which in its earlier stages was very profitable. The reason is that the charge for transportation to the Northern and Eastern cities destroys all the profits. A carload of watermelons worth $25 in Carolina must pay the railroad company $125 for the haul to Philadelphia. This leaves the producer an actual loss instead of a gain. The result is that the planters are abandoning what ought to be a very profitable crop. This year the acreage devoted to melons shows a decrease of 50 per cent., and unless some relief can be had there will be a further decrease next season." One hundred and twenty-five dollars for 20 tons figures out about one cent per ton-mile, which is only 1.4 mills higher than the average price received by the railroads of the country for *all* freight, including coal, lumber, pig iron, etc., in the year last reported by the Interstate Commerce Commission. We shall be glad to have the cause of the growers "espoused," for we like a bite of watermelon now and then, and it is costly business growing melons in the gardens of New York City. We want the freight rate from the South made as low as it reasonably can be made; but we are curious to know on what principle this espousal is to be based. If the business of the growers *must* be sustained, the government authorities must order the rates reduced sufficiently to sell the fruit in New York, even if they have to put them down to a tenth of a cent a mile for each ton, which is the rate that corn and iron ore pay on vessels in Lake Erie. In that case the railroads would lose money and the growers would prosper. If, however, the railroads as well as the growers merit the consideration of the Commissioners the question of reasonable profit on transportation comes in. In cases like this, where the highest possible rate is but a very small percentage above the average cost of hauling freight, a state tribunal confessedly has no justification in equity for making any reduction whatever, and to meet the demands of shippers it must cast about for some argument going to show that the carrier ought to make them a gift of money, for the general public good. A chief argument in such a case is that the merchandise in question is a necessary of life. If New York were freezing to death and coal could be had very cheaply in South Carolina, and at no place this side of there, the railroads might rightfully be compelled to make a rate that would move the coal. But water melons are a vital necessity to no one but children and negroes, except on very hot days, and we do not see how the necessity argument can be applied unless the Interstate Commerce Commission can arrange with its neighbor, the Weather Bureau, to prescribe high temperatures in Northern cities on fixed dates. Last year many carloads were wasted—sold for less than cost and freight—because they arrived in Northern cities on cool days. Then was when the railroads longed for some powerful body to espouse *their* cause. If freight bills must be lost, however, it might be a satisfaction to know that they were small ones, and we therefore respectfully suggest that the Interstate Commerce Commissioners order reductions, if reductions there must be, only on carloads that rot because they cannot be sold, leaving the rates on all others to be regulated by water competition, the competition of different markets and the rivalries of the railroads. It seems to us that these forces have worked powerfully already. Watermelons are so cheap in the North that New York City is likely to find difficulty in making the Croton aqueduct self-supporting.

The most suitable punishment for a train-robber is to squeeze him to death between hot harrows. The desirability of something of this kind is obvious enough to the meanest comprehension, but we never should have thought the idea feasible had we not seen it described in a patent which our esteemed contemporary, the Philadelphia *Record*, has copied, with illustrations, from the Patent Office Gazette. We cheerfully acknowledge, in passing, our feeling of guilt at having neglected the Patent Office Gazette so much of late; and we heartily commend our Quaker contemporary's enterprise. Our regretful retrospect is tempered only by the hope that most of our readers see the *Scientific American*, in which they can get all the latest good things without the unsympathetic comments which the office devil is so sure to interject into anything we write on the products of the American patent genius. Matthews & Sherbourne, two hydraulic or caloric (or hydrocaloric) engineers, of Topeka, are the inventors of the train-robber squelcher, and according to their description it is the climax of simplicity. As every one knows, a gang of train-robbers always climb up over the cross-head guides, steam chest and running-board so as to attack the cab of the locomotive on the front side. Now, when six of them get on to the running-board on the fireman's side and six on the other, Messrs. Matthews & Sherbourne just loosen a catch: the running boards, hung on hinges at their outer sides drop to a vertical position, and there you have a dozen robbers wedged between the boards and the boiler. How must a robber feel in such a position? Spikes are fixed in the edge of the running-board, and these prevent him from extricating himself; the more he pulled to get away the tighter he would become wedged. At the same time that the engineer springs the catches of the running-boards, steel shutters spring automatically about the windows of the cab and also at its rear, so that the engineer and fireman are fully protected from any bullets from without. Steam pipes having suitable discharging nozzles are situated at such points about the engine as would be liable to be attacked by the intruders. These pipes are connected to the boiler of the engine, and when a suitable cock is opened hot water and steam are discharged by the said pipes, and this either scalds the intruders or keeps them at a respectful distance. Similar devices are provided upon both the tender and the express car.

The British Railway and Canal Commission, the court of three members, higher than the Board of Trade, which hears complaints against the railroads, has made its annual report, and a brief review of it, published in the (London) *Railway News*, shows that the business before the court is increasing. The reviewer expresses confidence, however, that the act of 1894, reducing railroad rates, which furnishes the basis for most of this litigation, will be transient in its stimulating effect on the work of the court, though, like malignant fever, it is virulent while it lasts. The *Railway News* congratulates the railroads mildly on the fact that the traders do not get everything their own way, even in this court; and a number of cases in which the railroads came out ahead are cited. On the whole, "though the railroads have been exposed to tremendous expense, and have had one or two reverses, they have, by skillful and strenuous fighting, done pretty well in a court whose chief function is to keep on them a jealous eye and a tight grip in the interests of the trading public." The same journal states that the London & North Western has failed in its appeal to the higher court from the Commissioners' decision in the Northampton cartage case. After the act of 1894 the road increased certain rates and alleged that the increase was wholly on that portion of the price which was charged for cartage and that the cost of cartage was more than formerly; moreover, a consignee doing his own carting received a rebate. It appears, however, that the rebate allowed for cartage before the change in rates was of such size or character that evidence concerning it tended to weaken the claim of the road as to the reasons for the increase. This and certain subtle differences as to the construction of the law lost the road its case. Concerning the construction of the law and the technical points brought out in the trial, the Master of the Rolls said: "I did not understand one-tenth part of the arguments, neither do I understand the judgment in Rickett Smith's case; neither do I understand the judgment in the present case [by the lower Court]. It seems to me that the whole of the proceedings before this Court of Commission are so abstruse that it is very difficult to understand what anybody has said in the Court of Commission. It is very difficult to come to a conclusion as to what anybody has said, or to understand it, when it is said, either by counsel or by the Commissioners themselves." All which is delightfully frank.

The New York State Railroad Commissioners have ordered the Manhattan Elevated to run trains through over the Third avenue line, between the southern termini in New York City and 177th street, which is the northern terminus of the Suburban Rapid Transit, leased to and operated by the Manhattan. The order specifies "not less than 10 trains each way daily," meaning 10 southward in the morning and 10 northward in the afternoon. Before the Suburban was leased to the Manhattan all passengers had to change cars at 129th street, the northern terminus of the Manhattan proper and the junction of the two roads. After the Manhattan took in the smaller road, a law was passed requiring trains to be run through, but it was not obeyed, the company claiming that it would be impracticable to carry out the intention of the law with any reasonable economy, and, in fact, wholly impracticable without great delays to trains, unless the draw-bridge over the Harlem River, just north of the junction, could be kept closed. A five-minute delay at the draw might disarrange trains throughout the length of the crowded Third avenue line. Another difficulty, equally serious from a financial standpoint, would be the impossibility of accommodating all of the passengers going from the Third avenue line to the Suburban unless all of the north-bound trains were to be run through. If, for example, one third of the trains ought to be run through, the passengers on the other two would, in practice, have to change cars at the junction, because that would be more convenient than to wait at the starting point for a through train. But the people who got the law passed persisted in their complaint and the Commissioners evidently believe that these difficulties are not so great as the railroad represents, or that they can be partially obviated, and therefore have issued this compromise order. The order states that literal compliance with the law would not be good for the public service, but it is added that if the railroad does not comply with its terms within 30 days the matter will be referred to the Attorney General.

The Grand Central station at Forty-second street, New York City, when new, was a subject of special pride, and to add to its beauty and splendor the interior of the train shed was painted white: and then, to keep this white surface clean the switching engines were made to burn coke, and the road engines were kept outside—that is, they had to "fly" their trains in. This practice, always more or less dangerous, has been kept up ever since, without, we believe, any serious collision. But the risk has always been recognized, and it has lately been made the subject of a complaint to the State Railroad Commissioners, as appears from the following newspaper item:

"The State Board of Railroad Commissioners has dismissed the complaint of Thomas G. Dean, of New York City, against the New York Central & Hudson River, alleging dangerous practice in making flying switches in the yard approaching the station at Forty-second street. The decision was on the ground that the cars with engine detached are still under control of the air-brakes,

and that this practice, which has been in vogue for 30 years [the station was completed in 1871], is as safe, if not safer, than if the locomotive was permitted to proceed at the head of the train. An accident could only occur as the result of a misplaced switch, and a train can be as quickly stopped without as with the locomotive."

Thirty years is a long record, it is true; but what will happen if, just after an engine has cut loose and has got perhaps 150 ft. away from the cars, an air-hose between the engine and tender bursts? The brakeman who will, in such case, stop the cars before crashing into the tender must be quicker than a weasel. And, if we remember correctly, very few of the trains have air-valves so placed that the brakeman could apply the brakes instantly. Nine times out of ten he would probably decide that it was all he could do to escape with his life. Yet we are not disposed to be exacting about a practice that has worked so well for so many years. This seems to be one of those frequent cases where practice puts theory out of joint.

The Brooklyn Elevated road is trying the experiment on certain lines of carrying bicycles in the passenger (smoking) cars, collecting ten cents extra from each passenger who has one with him; and last Sunday about 5,000 pieces of this kind of "baggage" were carried. The line where the experiment is being tried is one, we believe, on which the stations are at no time so densely packed with passengers as is the case at the terminals of the older lines during the morning and evening rush hours. At a crowded elevated station the wheels would be a nuisance on the stairs. The Brooklyn Elevated will have to take care to see that the public-spirited legislators at Albany do not conclude, when they hear of this experiment, that they ought at once to make a law compelling the Brooklyn Elevated and all other roads to carry bicycles for nothing. If once it is shown that this scheme is liked by owners of wheels, that will be sufficient reason for the lawmakers to decide to order the railroads to give them the service free. The mathematicians of the legislative halls would probably have no trouble whatever in figuring out that 20 bicycles on a car do not increase its weight two per cent.; and that two per cent. more weight would require only $\frac{1}{1000}$ per cent more coal. How can the audacious and avaricious railroads justify the imposition of a charge for such a little item as that?

The Master Mechanics' Convention.

(*Continued from page* 471.)

The results of records kept show that in one large roundhouse, in which 150 engines are turned per day, it was found that between three and four engines per month have pipes reground. Of these, about 40 per cent. had either loose cylinder saddles or had been out of shops after general repairs from two to three months only.

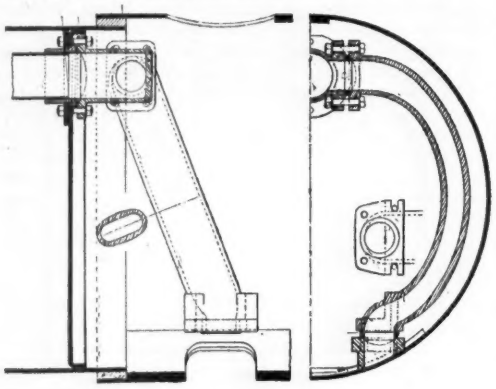

Fig. 2.

Sixth.—The suggestions for improvement, made by members, follow from the above, and are, briefly, that saddle fastenings be kept tight, and that more bolts be used to hold the pipe flanges together beyond a possibility of their working under the strains caused by expansion.

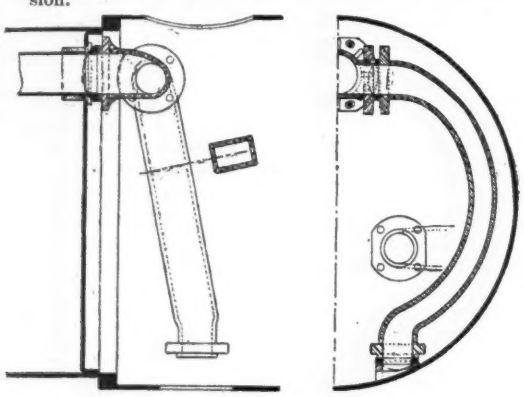

Fig. 3.

As a result of the replies received, the committee has come to the following conclusions:

Steam pipes should be of cast iron of flattened section, as light in the body as consistent with strength and the requirements of foundry practice. The shape of the pipes and general arrangement of the joints should be as shown in Figs. 2 and 3.

Pipes of malleable iron or cast steel are suggested as worthy of trial. Such pipes may be quite thin and still have ample strength, with the resulting advantage of springing instead of working at the joints when expansion strains are brought upon them.

The flanges should be arranged, where possible, to take four bolts or studs at both ends on all heavy engines. These bolts should be equally spaced, if possible. The joints should, in all cases, be made up with plano-convex brass joint-rings, the radii of their convex faces to be about equal to the inside diameters of the rings. These rings should be carefully ground upon their corresponding joint surfaces.

The exhaust-pipe joints should be made with flat surfaces, carefully scraped and fitted with surface plate, and bolted together without copper or other gaskets. A small amount of red lead, or some kind of heat hardening cement, may be used if preferred.

Mr. MCCONNELL: About two years ago we experimented with a wrought-iron steam pipe and found it very expensive. Last fall I had some correspondence with a view of using steel steam pipe. The manufacturers said they would not make a pipe unless it was made $\frac{5}{8}$ of an inch thick, then they would not guarantee it, and they wanted five cents a pound. I took the matter up with manufacturers of malleable iron, and it was their opinion they could not make malleable iron pipe. I convinced them that they could. We made a pattern for malleable pipe and got $\frac{7}{16}$-in. metal in the pipe, tested to 350 lbs. pressure before we used them. We received the castings and put them in service, and they have given satisfactory results. The old iron casting weighed 373 lbs., the malleable weighed 180; the cast-iron pipe cost $4.13 each, and the malleable iron pipe cost $5.16 each, making a difference of a dollar in the cost. With a malleable iron pipe the metal being so thin the expansion curves the pipe but does not disturb the joint. The results have been so satisfactory that we have an order in for quite a large number, and are going to put them in our engines. I tried copper and different compositions, but never had any success.

Mr. HERR: I like very much the design of bolt shown by the committee, replacing the ordinary two bolts at the bottom of the pipe with four. We find on heavy-pressure engines this arrangement of joints gives us no trouble.

Mr. BROWN: I indorse what the committee says with the exception of the material for the rings. I am decidedly in favor of the cast-iron rings; they are an improvement on the brass.

Mr. LEEDS: The cast-iron ring will be indorsed by any one who has used it. We have had fifteen years of experience with it in steam pipe and dry-pipe work, and have had excellent results with it.

NOON-HOUR DISCUSSION.

Radial Stay Boilers.—Commissioner RICKARD: The Board yesterday received a telegram from this body, stating that the question of radial staybolts would be the subject for debate before this convention at 12 o'clock to day. In response to that telegram, I represent the Board of Railroad Commissioners of the State of New York. I will read from the report of the Commissioners:

"In the explosion of locomotive boilers which have taken place in this state in several years past, many of them have been of boilers with crownsheets supported by radial stays. While there have been explosions of boilers where the fireboxes have been constructed with crownbars and rivets, the complete destruction of fireboxes in the former type were absent in the latter. Much has been said, and more may be said, as to the relative merits of crownbars and radial stays in such construction. The Board believes this is a subject which should receive the earnest consideration of all persons engaged in boiler construction."

Mr. MITCHELL: Our experience on the Erie Railroad, where we have about 300 of the radial-stayed boiler, is that they give better service than the crownbar and rivet. We have had one crownsheet fail with the radial stay boiler, which was strictly due to low water, the sheet pulling away from the stays on account of the heat. That was the only boiler we have had fail, whereas we have had more failures with the crownbars. The radial-stay boilers can be kept cleaner, washed out better, less liability of burning, more easily repaired, and give more space for the generation of steam. Of course, the main thing is to get your stays as nearly radial as possible, and to have the proper material in the staybolts. With that construction, I consider the radial-stay boiler is superior to the crownbar.

Mr. FORSYTH: I should like to ask the Commissioner whether his statistics show a greater loss of life or injury to persons with the radial-stay boilers than with the crownbar boilers?

Commissioner RICKARD: I am not prepared to give the exact number, but my impression is that there are more fatal results from the explosion of the radial-stay boilers. In every instance where a radial-stay boiler has been exploded, it has been a complete wreck; not a rent here and a tear there, but demolished completely, as if by dynamite. These appearances are not so apparent in the boilers with the crownbars and rivets.

Mr. GIBBS: On the Milwaukee & St. Paul we have been using radial-stay boilers for some time, and have adopted them as our standard, and see no reason to go back to the old crownbar boiler. The new boilers have been in the large, heavy-pressure engines, carrying as high as 200 lbs. pressure. We had one case of low water, when the crownsheet of a radial-stay boiler pulled down, the stays pulled, the steam escaped through the breaks, but the engine did not leave the track. I see no no reason why the explosion with the radial-stay boiler should be more dangerous than the crownbar boiler; and there is every reason why the radial-stay boiler should be a safer one. We consider it important to place the stays radial to the crownsheets, and not make a compromise between the angle of the crownsheet and wagon top, because the crownsheet is thinner metal than the wagon top.

Mr. HERR: I had some experience with locomotives exploding, having radial stays, and those having crownbars, while engaged in locomotive shop work some time ago. There were five exploded engines brought to the shop at various times to undergo repairs. There where three of the radial-stay type and two of the crownbar type. My experience in inspecting and repairing those boilers is the reverse of that stated by Commissioner Rickard. The crownbar boilers in those cases were both very badly destroyed. The radial-stay boilers had their crownsheets pulled down. In one case it was repaired. The stays had pulled through and allowed the water to escape, without great destruction of the boiler. I can see no reason from the construction of the boiler why the radial stay type should not be equally as safe as the crownbar; and in the matter of keeping the boiler clean and in readiness for inspection, there is considerable to be said in favor of the radial-stay type.

Mr. RETTEW: We have 19 engines on our road of the Wooten type. They have radial-stay boilers, and they are giving us trouble all the time. We put in on an average 100 staybolts on each one of these engines every year. We have more trouble with the radial-stay than with the crownbar boiler.

Mr. BROWN: As already stated the radial-stay boiler keeps clean better, there is more room to steam, and no possibility of scale getting lodged there. You can place your stays closer together than you can in the crownbar. I guess three-quarters of the engines now built have radial-stay boilers. I do not see any reason why a crownbar boiler should be any better than the radial-stay boiler.

Mr. QUEREAU: It would be nearer the truth, and perhaps the fact in the case, if the term "radial stay" in the Commissioners' report had referred to a peculiar design of radial stay, and not be made to apply to the radial-staybolt boilers in general. We know there are several designs of radial-stay boilers, and as far as my information goes, which I must admit is limited, most of the accidents of radial-stay boilers are peculiar to certain types; and if railroad newspaper accounts are to be credited, the explosions, except in cases of low water, are due to bad design and improper inspection; but not to the feature of the radial stay. (Applause.)

Mr. SOULE: To my mind, the difference hinges on another fact not touched upon. In the firebox with the crown supported by crownbars, it is possible to insert the crownbolts at right angles to the surface. That is also true in the Belpaire type of construction. In the radial-stay type, it is not always possible. Some of the stays are not exactly on radial lines, but deflect from that. The only universal form of crownbar bolt is a short vertical bolt with a button head, driven through the sheet, and supported by nuts above the crownbars. If the water gets low, and the fire reaches the crown, without any water over it, the first effect is to soften the metal, the next is for the metal to sag, by which sagging it will draw the metal away from the crownbar bolts, and in that way open little apertures through which the steam and water can escape down into the firebox, and thus give the engineer notice of what is going to happen and relieve the pressure. We adopted it as standard practice to use no screw stays in the Belpaire type; we put in button-head stays, for the reason that if the crown is burned and the metal softens and sags, the same thing happens as in the case of the crownbar construction. I have never known of a radial-stay boiler where button-head bolts are used. Therefore, to my mind, the Belpaire construction and the crownbar construction are safer than the radial stay, where the crownsheet is burned.

Commissioner RICKARD: In every instance I have mentioned in my report the boiler was burned; two of them were burned down to one-eighth of an inch of the mud ring. I have been connected with railroads for 40 years, and never saw a locomotive boiler that exploded on account of faulty construction. I have seen one or two, but there were palpable evidences they had been heated. My whole experience has been with boilers short of water, rivet holes enlarged, radial stays pulled out and leaving the threads intact; that is the point I want to get at.

Mr. MITCHELL: In our construction we put the button-head stay in the top for six rows, three each side of the center. If there is a row through the center, we put three each side of the center, making seven rows, and that construction is what I am talking about. If the crownsheet fails with that construction, I can see no difference between that and the crownbar.

Mr. PECK: Seventy-five of our locomotives have radial stays; and I have never yet seen a radial-stay boiler explode with the proper amount of water on the crownsheet.

Mr. SINCLAIR: It is scarcely worth while at this late day to go back and discuss the crownbar as a substitute for radial stays. I had occasion within the year to look over the illustrations for several years in the engineering papers to see what the prevailing practice in boiler construction was and found that over 75 per cent. of the boilers built were provided with radial stays. The men designing these boilers are perfectly competent to calculate the strains for the ordinary work the boiler has to perform, and they can produce a boiler just strong enough for practical purposes.

Mr. SOULE: I would not like to be understood as endorsing the crownbar construction in preference to the

radial stay. I simply wanted to bring out that one feature of it, the use of the button-head bolt, which is common practice with crownbar boilers, and which, until Mr. Mitchell spoke of it, I supposed could not be adapted to the radial-stay construction. If it is possible to introduce as many as six rows of button-head stays in the radial-stay boiler, I judge that construction would be as safe, in the event of a burned boiler crownsheet, as the crownbar construction.

Mr. VAUCLAIN: I cannot see any question as to the strength and durability of radial stays. If it is a desirable to have the radial stays secured through the sheet merely, so that in case the crownsheet becomes hot, it tears off the stays, and perhaps puts out the fire or relieves the pressure, it is all right, provided you do it so that the crown has an arch to it and sufficient slope, so that only a few stays would tear off. If the crown were flat and perfectly level, a disaster might occur. It is better to make as many of the radial stays as go through the crown with a button-headed bolt. This is very easily done, and can be done for every bolt across the crownsheet, provided you make a suitable arrangement of corner where the crownsheet joins with the firebox. The proportion of radial-stay boilers that we build is about 90 per cent. If it is necessary to use the crownbar, my judgment would be to abandon altogether the old style of crownbar, and use a new type coming into use, namely, one with a T-iron, composed of steel the same quality as the boiler, and placed a reasonable distance, say, 4 in., from the crownsheet, so that you could have almost the same advantage in cleaning your crownsheet as with the radial-stay boiler.

Mr. FORNEY: The discussion is somewhat purposeless, from the fact that we are talking about different things. The Railroad Commission refers especially to the class of locomotives of the Wooten type. I think the testimony of most of the members will be that a larger proportion of that class of locomotive boilers have exploded than any other class set with radial stays I always accept the first charge that a boiler exploded on account of low water with hesitation. I have examined boiler explosions to see whether there was low water, and in many cases could not find the slightest evidence that there was.

Commissioner RICKARD: The exploded boiler is examined in all its details, and the best evidence in the world of low water is the silent testimony of the firebox and crownsheet itself. If the side sheets of a firebox are of a blue color a day or two after the explosion occurs, down to 8 or 10 in. of the mud ring, together with the evidence of the larger holes, the rivets pulled out and the threads intact, and these rivets and staybolts have blue heat beyond the thickess of the sheet, the evidence is there that that sheet was hot.

Mr. WELLS: In my 25 years' experience, I have examined quite a number of boilers that had been exploded, and I do not know of a single case of what was called an explosion that was caused by the water becoming low on the crownsheet. I have seen a great many crownsheets burned; the heads of the bolts holding the crown would pull off, and the sheet buckle down, and the water and steam escape and put out the fire. I have seen quite a number of backs that were blown entirely out of the shell of the boiler from the side sheet giving way, caused by broken staybolts. I saw a radial-stay boiler seven years ago. It was said that it had exploded I found on examination that the side sheet on the right-hand side had given way, on account of broken stays. There were about 60 broken staybolts on that side, and three rows, almost the entire length, were broken, and some bolts on the fourth row, before the sheet pulled the other bolts through. In that case, when the crownsheet came to the first row of bolts that had heads on them it sheared the heads off as nicely as it could be done with shears, produced a buckle in the sheet at that point, and went to the next row, and sheared them off, and by that time the side sheet had gane over until it touched the side sheet on the other side, and it went no further. The sheet did not blow up; the engine was not thrown from the track, and no damage was done. I consider that the radial staybolt is a safer one than the crownbar boiler.

Mr. Forsyth offered the following:

Resolved.—That the radial staybolt boiler is as safe as the crownbar boiler, and that the former is easier to keep clean and more economical in repairs. Carried.

WEDNESDAY'S SESSION.

President BLACKALL called the meeting to order at 9:25.

The Special Committee on the subject of Scholarships in the Stevens Institute, referred to in the address of the President, gave notice that at the next convention a motion to amend the constitution would be made as follows:

To amend Article VII. to read in the second paragraph: "Acceptable candidates for the scholarship shall be, first, sons of members of deceased members of the association. If there are not a sufficient number of such applicants for the June examination, then applications will be received from other railway employees or the sons of other employees for the fall examinations." The Secretary shall issue a proper circular in this case as before.

Also the last parapraph of Article VII. shall be amended to read: "The successful candidate shall be required to take the course in mechanical engineering."

On motion of Mr. SINCLAIR the by-laws were amended to make the date of the annual convention hereafter the third Tuesday in June of each year.

Apprentices.—The report of the Committee on "Apprentice Boys" was then read by Mr. W. F. Bradley, the Chairman.

THE APPRENTICE BOY.

(The Committee on this subject consisted of Messrs. W. F. Bradley, F. D. Casanave, A. E. Manchester and H. P. Robinson.)

The committee expressed the belief that the change in industrial conditions must bring about a new era for the apprentice. In modern methods he must be a small unit in a great organization, and must be taught fidelity and loyalty to the corporation which he serves. The cemmittee addressed circulars to members and letters to several educational institutions. A large number of replies indicated the belief that the shopman of the future will be simply an operative, but the majority of those answering believe also that there will always be a large field for the mechanic of special skill. Mr. Sanderson expressed an opinion which the committee thought very valuable, to the effect that mechanics should be classed as able mechanics and ordinary mechanics. With regard to the ratio of apprentices to mechanics the variation was too great to permit classification. Some shops employ as many as 50 per cent. of apprentices, and others as low as one per cent., but the committee thinks that the ordinary railroad shop will do best to employ about one apprentice to five able mechanics. The committee believes that it would be useless to recommend an apprentice system, but finds gratifying evidence of a great number of evening schools in drawing and mathematics, although the system of instruction should be made more uniform and consistent. Professor Goss writes a long communication outlining a system of school work for shop apprentices. He would have local schools under the supervision of a permanent committee of the Master Mechanics' Association. Each college undertaking to help in the work should put each apprentice school for which it is responsible in charge of some member of its faculty. It would be his duty to assist in organizing the school, to inspect the schools under his charge, to aid in instruction, to conduct examinations and make reports. The college would issue certificates giving the students credit for the work accomplished. The course of study and practice would be three years, two evenings each week. It would cover arithmetic, algebra and higher algebra, geometry and drawing. The study in algebra would be carried on for the last two years and the drawing through the three years. Mr. Goss adds that Purdue University is about to issue a circular setting forth two conditions under which apprentices or skilled shopmen may be admitted to regular courses in the Engineering Department of that institution. Mr. Howerth, Class Study Secretary of the University of Chicago, writes a letter to say that the Department of University Extension of that institution looks with favor upon a scheme by which the University can co-operate in educating railroad apprentices. If the Master Mechanics' Association will organize classes. provide rooms and transportation and pay the board of an instructor and will furnish at least three circuits of six centers each, each center to take a course of 12 evening lectures at $50 for each course, the University will provide a competent instructor and direct the work. Assuming that each class is limited to 30 members, the expense to each member of the class would be $2.67.

Mr. BRADLEY: It seems to me there is an awakening interest in the proposition as to how best to train the boy and of how best to train the man; how to get their best efforts and how to get their loyalty.

Mr. BRIGGS: I have given this subject considerable thought in the course of my life and I have almost come to the conclusion that as a rule the desire to improve the condition of the men in the service is overcome or defeated by various causes over which we have no control. The fact must be evident to every one that with all the combinations there are existing in this great and free country of ours we must come to the conclusion that there is often a great deal too much freedom. Men are free to combine themselves into different organizations; they are free to interview our apprentice boys and to make such impressions on their minds as they choose and which are naturally detrimental to the interest of the corporations they work for. Ninety-nine times out of a hundred a boy will go into a shop and will be grateful for the opportunity, but he soon forgets entirely the fact that he is learning a trade, which is in the end his fortune, and the first thing you know, about the time he gets to be a little useful, he wants a big raise in his wages, and he is encouraged in that by most of the men in the employ of the company in his line of business.

President SMART, of Purdue University: This is an important question, but I know very little about apprentice schools. I hardly know what you want, and I would like to find out. Purdue is in a helpful mood; we are willing to help along this very important matter, and so we are seeking information. We think we have done a great deal of good in our state in diffusing knowledge among 55,000 farmers. I do not know why we cannot help mechanics in the same way. We ought to be able to do so, and it is our purpose to encourage a series of lectures on technical subjects, somewhat popular and instructive, going to railroad centers and delivering a course of lectures which may be illustrated in a way that will interest the men, and more especially to incite them to study and improve themselves. This, of course, must be done in a very prudent, careful way, so as not to do mischief. We expect to deliver lectures either in the shops or in a public hall, on, say, the history and development of the locomotive, and illustrated with forty or fifty views which we are gathering from all parts of the world to show the different constructions. We would also have lectures on the transmission of power, the method of using fuel, etc., illustrating perhaps some of the great shops of the world, the shipbuilding yards and the ocean liner. We have developed this line to such an extent that we think it will be a success, but as to apprentices' schools, we are willing to do what you want us to do, and what we can do.

Mr. FORSYTH: The committee say that it is useless for this association to recommend an apprentice system; I do not agree with them; I think it is one of the most important things that they should do. If they have not made any definite recommendation they should do so. I move, therefore, that the subject be continued, with instructions to the committee to recommend a course of shop training for machinists' apprentices, or any apprentice in locomotive shops, and also to make definite recommendtions in regard to the technical education of shop apprentices. Carried.

Mr. HERR: While no one values the advantages of the higher technical education more than I do, I still think that the most important part of the subject before us is the method of shop training, a subject which the committee's report almost entirely ignores. Purdue University, the Scranton School of Technology and many other worthy and competent institutions of learning are doing splendid work in the line of technical instruction, but I know of almost no shop in which a systematic method of instruction of the apprentices in their shop work is being followed up. This is one of the most important things in the future well-being of the apprentices which can well be considered.

Mr. BARR: I have given this matter of the training of men quite a good deal of attention. We have gone so far with the apprentice that we require a preliminary examination before they are employed as such; and I think undoubtedly that is one step in the right direction. Now, as to the education of apprentices, the recommendation in the report seems to be confined entirely to mathematics and drawings. I think training in physics, which is apparently neglected here, is one of the most important.

Mr. QUAYLE: In our road we take in two classes of apprentices. One is the boy who has a good common-school education and good moral habits, as far as we are able to find out, and is capable of receiving mechanical instruction. The other class are those who come from technical schools, and whom we advance more quickly, but if the boy who has not received a technical education can push ahead of a boy who has had a technical education, he takes the position, of course.

Mr. JOUGHINS: I believe that the report of this committee is the most important report we have received at this convention. If schools were provided in every possible place in connection with railroad locomotive work they would do an immense amount of good. There are one or two things in this recommendation which I would like to speak of in connection with the experience I had in teaching. Professor Goss, in his letter, recommended two evenings a week. I think four evenings a week is not too much. The young man is to take up study seriously. I am sure that the course as outlined can be extended. Any young man who will take four evenings a week can not only be taught the course as laid down here, but the elements of theoretical mechanics and physics, without any apparatus whatever.

Mr. BROWN: If we are satisfied that the boy will like the business we apprentice him for five years, and either put him on the floor, helping the machinists, or running light machinery. At the end of the second year we ask him which shop he wants to stay in to finish his time. When the boy decides which shop he will stay in we leave him there. We have a Railroad Y. M. C. A., which is encouraged very much by the company. Membership is two dollars, including privileges of various kinds. There is a drawing class, but we find the appretices will not attend it and pay two dollars a year for it. They do not take hold of such things as they should.

The report of the Committee on Subjects was then offered, which, on motion of Mr. Henderson, was adopted.

Subjects of Investigation for 1897.—Your Committee on Subjects of Investigation respectfully report such subjects as they would like to have investigated and reported on by special committees at the annual convention of 1897. The committee thought it advisable to confine such subjects to locomotive or shop practices which had not been reported on at previous meetings.

1. What kind of metal should be used in locomotive cylinder valve seats and slide valves; as hard as can be worked, medium, or soft? and should the hardness of the metal for valves and seats be the same? or should one be harder than the other? If so, which?

2. Which is the most economical, a planished iron boiler jacket, or a boiler jacket made of common sheet iron, or sheet steel, painted? The general appearance, first cost and cost of maintenance to be considered.

3. For anthracite and bituminous burning engines engaged in passenger and freight service, what should be the ratio of grate area to total heating surface, and to cylinder volume? For such engines, what is the best ratio between the diameter of cylinder and length of steam port?

4. What is the best method of securing crank-pin collars used in connection with solid rods?

5. Committee to report as to whether it would be advisable and practicable to introduce piece work in connection with locomotive repairs. Also best method of arriving at prices for the different operations.

6. Have cast steel driving wheel centers any advantage over cast iron, other than the reduction in weight?

7. What classes of work in an ordinary locomotive repair shop can best be performed with air motors, and what is the relative convenience and economy of air motors for such work, as compared with motors driven by electricity or steam? When air motors are used, should the shape of the cutting edge of drills, reamers, etc., be changed from the ordinary practice?

8. Is it desirable or economical to use extended piston rods for cylinders more than 18 in. in diameter in the simple American type of locomotive? How should such rods be carried through the front cylinder head, and what means should be provided for supporting the weight? What provision should be made for keeping dirt and dust from this piston rod?

9. What is the best material for piston rods, iron or steel?

10. Can cast steel be used successfully for eccentric straps, and is it superior to cast steel for this purpose?

11. Best construction and material for a locomotive pilot, to be used in connection with M. C. B. coupler.

12. A revision of the air-brake instruction rules. The committee to work with a similar committee appointed

by the Master Car Builders' Association and to make a joint report to both associations.

The committee consisted of Messrs. A. E. Mitchell, T. B. Purvis, Jr., and S. Higgins.

Driving-Box Wedges.—The Secretary read the report of the Committee on Driving Box Wedges.

(The committee consisted of Messrs. J. Davis Barnett, H. A. Childs, T. J. Hatswell, R. Atkinson and R. E. Reading).

The conclusions were: The strongest point the replies justify us making is that those who dispense with movable wedges do not go back to them. It is open for a new committee to report on the relative value of tapered and parallel liners, and on the wearing value of of cast-iron, steel and drilled jaw faces.

Mr. CHILDS: We have on the New York division of the Erie Road between 60 and 70 engines running stationary driving-box wedges, and on the Erie system we have upward of 200. They all give excellent results.

Mr. MACKENZIE: We have a number of engines running without the adjustable wedge. There are two shoes, and the jaws are made perfectly parallel the same as the face of the shoes. I find that is a pretty good thing when the new work is put up, but if you want to line them, it is not so good a thing for the simple reason that you have got to push the shoe and the liner up the whole distance of the jaw. I believe if we are going into the stationary wedge that we want to make the wearing surfaces of the driving box as wide as possible. I say make the jaws not less than five inches and then the face of your wedge not less than eight inches so as to have a good back bearing there. If that is done I believe you can run them for years without touching them.

Mr. THOMAS: We have a number of engines running which have a double shoe and a wedge combined; in other words, we have the same shoe in front, with the wedge as we have over the pedestal, and my experience with that, after four or five years' service, has been that it is more desirable than any other plan I have tried.

Mr RETTEW: At our last meeting it was suggested that the master mechanics of the different roads should try the standard wedge on one or more engines. We had an engine about going into the shop and I lengthened out the main wedge to make it long enough so that it could not be raised, and being placed in the frame so as to make the wedge and shoe parallel. That engine has made 25,500 miles since that time. After she had run ten months, I had the brasses all taken down and the shoes examined and found they were all in nice working order. The engineer complained of pounding a little. We took a thirty-second of an inch liner, put up our wedges again, but they were so tight we could not move them. There were only four out of the six driving wheels in which we could get the sixty-fourths liner in, or a piece of tin which was put in, and the engine has been working first-rate ever since. The expense of the engine has been 0.48 of a cent per mile during the time she has been in service.

Mr. MCINTOSH: I have had experience with a few ten-wheel engines, fitted with the rigid wedges, and they have been satisfactory. I think, however, there would be difficulty in putting in thin liners.

Steps and Handholds.—The Secretary read the report of the Committee on Steps and Handholds.

STEPS AND HANDHOLDS.

(The committee consisted of Messrs. John Medway, H. Bartlett, J. T. Gordon, F. M. Twombly and G. H. Baker.)

To the circular of inquiry of this committee, to members of the association, in regard to the position, arrangement and form of steps and handholds, forty-five replies were received. With reference to the form of steps and handholds leading to gangway of cab twenty-nine members favor the use of a wide double step secured to the tender frame at each front corner, and none at back corners, while eight prefer a wide step, each at back corner of engine and front of tender. Nearly all recommend long vertical grabirons or handholds, conveniently arranged at the front corner of tank, back of cab, and in connection with the cab bracket.

A large majority consider the common arrangement of a step, each on back corner of engine and front of tender, to be sometimes confusing and dangerous.

Thirty-two members favor wide steps on tender of the form extensively used on modern locomotives. These usually contain a deep opening, which the committee considered an element of danger, in that the foot is liable to slip through. It, therefore, recommended that the distance between the tread and opening be not less than 5 in.

A diversity of opinion exists with reference to the form and location of steps and handholds with which to reach the headlight; substantially all agree that on locomotives with extension smoke boxes a firm step with roughened tread and flanged sides should be fastened to the smoke-box sheet at a convenient position between the steam chest and headlight. Details, however, must be governed by local conditions, which vary to such an extent as to preclude the adoption of a fixed plan, but the general arrangement such as is substantially the practice of a majority the committee recommended. For reaching the sandbox a step similar to that on smokebox seems to meet the requirements.

Steps suspended transversely from the back of tender frame are restricted to switching and pushing locomotives. For this purpose, was recommended a simple form of long step with back guard to prevent foot from slipping through. It should be set at the uniform height of 12 in. from the rail. Care should be taken to leave an opening between the tread and riser sufficient to dispose of ice and snow, but not large enough to admit a part of the foot. In connection with this step, a long horizontal handrail should be placed at a convenient height.

In conclusion, the committee was of the opinion that to insure comparative safety the form and location of locomotive steps and handholds should be so nearly uniform that in mounting or alighting one could, even in the dark, readily locate with his feet and hands all the steps and handholds of any locomotive.

Mr. MACKENZIE read the report of the Committee on Truck Swing Hangers.

Mr. LEEDS moved that the report be received; that the committee be continued, and that the roads make experiments during the year for the benefit of the committee. Carried.

The report of the Committee on Locomotive Grates was next in order. The committee presented a long report which was not in print and which was accompanied with 25 blueprints. After some discussion as to what should be done with the report, on motion of Mr. Briggs, the report was referred back to the committee, to be presented at the convention of 1897.

The report of the Committee on Thickness of Engine Truck Wheel Flanges was presented by Mr. Leeds.

THICKNESS OF ENGINE TRUCK WHEEL FLANGES.

(The committee on this subject consisted of Messrs. Leeds, Rhodes, Galbraith, Stewart and Croman.)

The committee was asked to recommend the minimum thickness allowable for the flanges of leading truck wheels. On investigation they ascertained that the allowable thicknesses vary from ¾ of an inch to 1⅛ of an inch in steel wheels and from ⅞ to 1 3/16 in cast-iron wheels in the practice of different roads. The committee finally decided to recommend that the minimum thickness be the same for both iron and steel wheels, and, second, that this be 1 in. measured at a point ¾ of an inch from the top of the flange.

On motion the report was received, and the changes recommended were accepted and adopted as standard.

The Secretary read the report of the Committee on Standard Size of Boiler Tubes.

STANDARD SIZE OF BOILER TUBES.

(The committee on this subject was Mr. Wm. Swanston.)

As the result of a circular addressed to the leading makers of locomotive boiler tubes asking approval principally of a proposed change from the Birmingham gage to a decimal gage, the committee recommends that the standard specifications for locomotive iron boiler tubes be changed to read as follows, under the head "Dimensions and Weight."

Tubes 2 In. Outside Diameter.

.095	in.	thick	and	weight	at	least	1·91	lbs.	per foot.
.110	"	"	"	"	"	"	2.19	"	" "
.125	"	"	"	"	"	"	2.47	"	" "
.135	"	"	"	"	"	"	2.65	"	" "

Tubes 2¼ In. Outside Diameter.

.095	in.	thick	and	weight	at	least	2 16	lbs.	per foot.
.110	"	"	"	"	"	"	2.48	"	" "
.125	"	"	"	"	"	"	2.80	"	" "
.135	"	"	"	"	"	"	3.01	"	" "

Under the heading of "Surface and Inspection," "And must be of uniform thickness throughout, except at the weld, where one gage number additional thickness will be allowed" be changed to read "where .0 5 in. additional thickness will be allowed."

In conclusion, the committee urges strongly the importance of using the decimal gage in ordering all kinds of material for which it was designed and adopted by the association.

It was resolved, that the modification of the existing standard recommended by the committee be adopted.

Seconded by Mr. Barr. Carried.

On motion of Mr. Lewis, a motion was adopted:

Resolved, That it is the sense of this Association that the statement of performance of locomotives should be made on the basis of ton-miles of trainload in lieu of train-miles or of loaded car-miles as is the prevailing practice at present.

The officers were then elected for the ensuing year as follows:

President—R. H. Soule.

First Vice-President—Pulaski Leeds.

Second Vice-President—Robert Quayle.

Treasurer—O. Stewart.

At a meeting of the Executive Committee Mr. John W. Cloud was elected Secretary.

Mr. Sinclair read the report on "To Harmonize Standards." Received.

The meeting then adopted a special vote of thanks to the retiring officers.

Mr. McConnell spoke briefly in favor of Colorado Springs as the next meeting place. Mr. Leeds asked the member to mention places. The Secretary read a telegram from Mr. Morris, of the Chesapeake & Ohio, inviting the convention to meet at Old Point Comfort. A telegram had also been received from Bar Harbor, and personal requests had been made in behalf of Niagara Falls and Chicago.

The convention took a test vote on the question, which resulted as follows:

Colorado Springs	40
Old Point Comfort	7
Bar Harbor	5
Niagara Falls	5
Scattering	7

The convention then adjourned at 1:20 p. m.

TECHNICAL.

Manufacturing and Business.

The Garlock Packing Co., of Palmyra, N. Y., and Rome, Ga., has closed its office at Omaha, Neb., and opened a new office and salesroom at 1713 Wazee street Denver, Colo., with Mr. Charles B. Whitman as manager.

The Mount Vernon Car Mfg. Co. has elected the following officers: President, D. O. Settlemire, of Litchfield, Ill.; Vice-President, George W. Evans, Mount Vernon, Ill.; Secretary and Treasurer, W. C. Arthurs, Mount Vernon; Superintendent, Frank Snyder, Mount Vernon.

The Detroit Steel & Spring Co., of Detroit, has been quite busy for a considerable time past, and on Monday of last week it was necessary to put the works on double time in order to keep up with the orders.

Iron and Steel.

The annual meeting of the stockholders of the Bethlehem Iron Co. was held on June 23 in Bethlehem, Pa. The following directors were elected, a total of 82,296 shares of stock being represented at the meeting: Robert H. Sayre, Sr., Joseph Wharton, E. P. Wilbur, Sr., Robert P. Linderman, George H. Myers, Beaureau Borie and J. P. Lippincott. The directors elected the following officers: President, R. P. Linderman; Vice-President and General Manager, R. H. Sayre, Sr.; Second Vice-President, R. W. Davenport; Treasurer, C. O. Brunner; Secretary, A. S. Schropp.

The Andrews Brothers Co., at Youngstown, O., is making extensive repairs and improvements to its plant. Hazleton Furnace has been blown out, and will be relined and refitted throughout. A new engine-house has been built, and two new blowing engines from E. P. Allis Co. have been put in position.

Jones & Laughlins, Limited, operating the American Iron and Steel Works at Pittsburgh, are making extensive improvements and additions to their plant. These are expected to increase its capacity to 2,000 tons of Bessemer and basic open-hearth steel per 24 hours. A 34-in. blooming mill, said to be the largest in the country, is being put in, and will be driven by a pair of 50 in. × 72 in. reversing engines, built by Mackintosh, Hemphill & Co. To provide for the additional converting capacity required for this large mill, the two 7-ton convertors have already been enlarged to 10 tons each. These, with the other additions which are to be made, will make the American Iron and Steel Works one of the largest and best equipped plants in the country.

Improvements are to be made in several departments of the Pennsylvania Steel Works. The blooming mill which is to supplant No. 1 is to be completed; it will be 82 ft. wide and will contain 26 pits and 4 large traveling cranes. A 50-ton furnace has been put on at the open hearth department. All of the departments are now running on full time and have plenty of orders ahead.

New Stations and Shops.

The Buffalo Rochester & Pittsburgh is to erect car shops at DuBois, Pa., comprising a mill building, 60×200 ft.; engine house, 60×125 ft.; blacksmith and machine house, 40×50 ft.; store house, 48×80 ft., and a paint house, 24×96 ft. W. E. Hoyt, Chief Engineer of the company at Rochester, has the work in charge and will shortly give out the contracts. The buildings will be of brick and iron.

Interlocking.

The National Switch & Signal Company has been awarded the contract for putting in a large interlocking plant on the Philadelphia & Reading at the junction of the Norristown and Germantown lines at Seventeenth street and Indiana avenue, Philadelphia.

The same company has the contract for interlocking the crossing of the Chicago & West Michigan with the Manistee & Grand Rapids, near Baldwin, Mich.; for interlocking the crossing of the Wisconsin Central with the Chicago, Milwaukee & St. Paul roads at Hilbert Junction; for a 72-lever machine for the crossing of the Great Northern with the Northern Pacific at Seattle, Wash., and a plant in Chicago for the crossing of the Chicago, Milwaukee & St. Paul with the North Chicago Street Railway at Indiana street.

Mineral Production of New South Wales.

The total value of mineral produced by New South Wales in 1895 was £4,552,018, a decrease of £504,118 upon the value of that produced in 1894. This may be accounted for by the decrease in the production of silver, and also to some extent by the great falling off in the price of coal, for, although there was an increase of 66,513 tons in the output of coal for 1895, over that for 1894, still there is a decrease of £60,264 in the total value. There was a marked advance in the output of gold, making an increase of £159,211 over that of 1894. This increase is probably due in great measure to the large number of unemployed men sent to the goldfields. Good progress has also been made in the methods of treatment of the auriferous refractory ores which abound in the country. The falling off in silver and lead was caused by the very low prices which prevailed during the year, combined with a disastrous fire, making necessary a temporary stoppage of operations at the Proprietary Company's mine at Broken Hill.

Iron Manufacture in Japan.

According to a recent announcement in the *Official Gazette*, the Imperial Diet has approved of the appropriation of over 4,000,000 yen (about £800,000) for the erection of a steel works. It is expected that the works will be completed by March, 1899, but will not be in full running order until April of the following year. The estimated output of the works is to be 60,000 tons a year at first. It is expected that ultimately Japan will be able to supply all the iron and steel required for her various engineering projects.

Locomotive Building in Austria.

During 1895, 183 new locomotives were submitted to official inspection in Austria, an increase of 83 over the year 1894. Of the total 44 were built in the works of the Austro-Hungarian State Railroad Company, 62 in the Sigl works at Neustadt, 54 at the Floridsdorf Locomotive Works, 19 at the works of Messrs. Krauss & Co., at Linz, 1 by the Prague Iron Industry Company and 3 in the works of Messrs. Krauss & Co., in Munich.

New Rails for the Baltimore & Ohio.

The Baltimore & Ohio has recently placed contracts for 24,250 tons of new rails, which will be laid on the lines both east and west of the Ohio River. The orders include 16,000 tons placed with the Edgar Thomson Steel Works and 4,000 tons with the Cambria Iron Works.

These 20,000 tons of rail will be of the 85-lb section recommended by the American Society of Civil Engineers Committee; the rest of the order went to the Illinois Steel Co. and includes 850 tons of 85-lb. rail, Am. Soc. C. E. standard; 400 tons of 80-lb., Am. Soc. C. E. standard, and 3,000 tons of 67-lb. rail, Baltimore & Ohio standard.

New Long Island Sound Steamer.

The Stonington Line is to have a new steamer, plans for which have been prepared by Harlan & Hollingsworth. The new boat will be 400 feet long, with twin screws and triple expansion engines. She will be named the Vermont, in honor of the only New England State that has not had one of the company's boats named after it. This line runs boats from New York to both Stonington and Providence.

American and English Steel Output.

The figures of the British Iron Trade Association for the production of steel in 1895 furnish a means of comparison of the production of England with that of the United States for that year. England's production of Bessemer ingots for 1895 was 1,535,225 gross tons, as against 4,909,128 gross tons produced by the United States, while England's production of open-hearth steel ingots was 1,724,737 gross tons, as against 1,137,182 gross tons by the United States. These figures, as compared with those of former years, show that England has been practically standing still in the production of Bessemer steel, while the American production shows an increase of 1,337,815 tons over that in 1894. In open-hearth steel production England is still ahead of the United States, although in comparing the yearly production of the two countries for the last 10 years it may be seen that the United States is quite rapidly approaching the output of England.

Coal and Pig Iron Production.

Mr. E. W. Parker, of the United States Geological Survey, in an article for the forthcoming volume of the "Mineral Resources of the United States," draws an interesting comparison between the production of coal and the manufacture of pig iron in 1895. He says the output from the coal mines of the United States in 1895 exceeded that of any previous year in the history of the country, aggregating 193,117,530 short tons. This was an increase of 22,476,004 short tons over the product of 1894, about 12½ per cent. The production of pig iron, according to the annual report of the American Iron & Steel Association, increased from 6,657,388 long tons in 1894 to 9,446,308 long tons in 1895. Assuming the consumption of coal to be 1½ tons for each ton of pig iron produced, an increased production of coal to the amount of over 4,500,000 short tons is at once accounted for.

Wire and Cut Nails.

The Sibley *Journal of Mechanical Engineering*, for June, gives the results of some experiments, by Mr. R. T. Hanford, to determine the comparative holding power of wire and cut nails. The tests were made on pieces of white pine, joined with simple lap joints fastened by the nails. These were subjected to transverse stresses, in some cases parallel to the axes of the nails, in others at right angles. When the load was applied perpendicular to the nails, the wood was often split and the cut nails were often broken, while the wire-nail joints were broken by bending and drawing the nails. When the load was applied in the direction in which the nails were driven, the joints were broken by the nails being drawn almost without being bent. Under this same manner of loading, the wire nails were started by smaller loads than the cut nails, yet when the cut nails were started they yielded rapidly, while the wire nails held nearly as well as at first. In all the cases tried, the cut nails were found superior in strength and rigidity, while in one-half the cases wire nails gave the joints greater resilience than the cut nails.

A New Steamboat for the People's Line.

The People's Line, operating boats on the Hudson River between New York and Albany, has completed the construction of its new steamboat Adirondack, which the officers claim to be the largest and finest vessel ever built for river navigation. The Adirondack was designed by Mr. John Englis, of the company, and was built by the firm of John Englis & Sons, of Brooklyn, N. Y. The keel was laid on June 8, 1895, at Greenpoint, and the vessel was launched on Nov. 20. The hull is built principally of wood in order to insure the light draught of water necessary to navigate the Hudson as far as Albany. The hull is 412 ft. in length over all, and 400 ft. on the water line; 50-ft. beam and 90 ft. wide over guards; 13 ft. deep and draws 8 ft. of water; 4,500 tons gross and 3,000 tons net measurement, with a freight capacity of 1,000 tons. There are five decks, main, saloon, gallery, upper gallery and dome decks, with 350 staterooms, each room being entered from the saloon and having an outside window. The dining room is in the after part of the main deck, and is well lighted by large windows, which afford an uninterrupted view of both banks of the river from any part of the room; its seating capacity is for 250 persons. A search light, by means of which objects two miles distant may be plainly distinguished, has been placed on the pilot house.

The M. M. Excursion to the Schenectady Works.

On the afternoon of the 23d, a large number of Master Mechanics accepted the invitation of the Schenectady Locomotive Works to visit their plant at Schenectady. A special train had been provided through the kindness of Mr. Blackall, of the Delaware & Hudson. The members were escorted through the works by President Ellis, Superintendent Pitkin and other officers. The following engines were seen in different stages of construction: 20 engines for the New York, New Haven & Hartford, with 20×24 cylinders; 10 moguls for the New York, New Haven & Hartford, with 20×28 cylinders; 10 passenger engines for the New York Central, 19×24; five 10-wheel engines for the Southern Pacific; four engines for the Texas Midland; two switchers for C. H Hammond & Co. One of the machines that interested the members very much was a new mortising machine that had just been installed by Greenlee Bros & Co., of Chicago. The examples of castings from the American Steel Casting Co. for wheel centers were much admired. Lunch was served in the drafting room, where a large number of photographs of Schenectady engines were shown.

New Orleans Drainage.

The plans for the New Orleans drainage system have been indorsed by the City Council, and a bill is before the State Legislature to authorize the issuing of $5,000,000 five per cent. 40-year bonds to carry out the work.

British Locomotive Exports.

The locomotives exported from the United Kingdom in the first five months of this year amount in value to about $2,000,000. In the same period of 1895 the valuation was about $1,600,000, and in 1894 $1,700,000. The exports of locomotives to South America in the first five months of this year were valued at about $500,000, the increase over the preceding year having been small. The principal increase was in the exports to South Africa and to Australasia. The locomotives sent to South Africa aggregated about $315,000, and in the same period of 1895 $16,000. To Australasia the aggregate was about $200,000, and in the first five months of 1895, $50,000. The great increase in the exports to South Africa is accounted for by the fact which we mentioned in a recent review of the annual report of the General Manager of Cape Railways for 1895. This report showed that the sudden and very large increase in traffic had necessitated large orders for new locomotives. When those orders are filled shipments to that country will no doubt be small for some years to come.

THE SCRAP HEAP.

Notes.

The Legislature of Louisiana has before it a bill to establish a State Railroad Commission.

Chicago is not far behind Buckeye Park. A show collision is to come off in that city on the Fourth of July, at Ridgeland avenue and Sixteenth street.

The International & Great Northern roundhouse and car-houses at Laredo, Tex., were destroyed by fire on the night of June 15, together with four cars and a locomotive. Loss $60,000.

Nearly all of the perishable freight sent north from New Orleans during the past season, vegetables as well as fruit, was carried in refrigerator cars and kept cool with ice, about five tons being placed in the ice boxes of each car. This is a new feature in dealing with vegetables, these having been heretofore carried mostly in ventilated freight cars; that is, common box cars with numerous large grated openings.

The ticket scalpers recently convicted in New York City of selling fraudulent tickets over the Southern Pacific have been sentenced to 2½ years' imprisonment. It appears that they carried on an extensive business, and a printing office was found in New York where they had a stock of advertisers' tickets and conductors' exchange checks for limited tickets They were caught by a train agent or collector who acted as a detective and joined in their schemes. It is stated that within one year over 400 innocent holders of fraudulent tickets were put off the trains of the Southern Pacific in Texas. There being no sufficient penalties for ticket forgery under the laws of Louisiana and Texas, the prisoners were tried under the law making it a felony to use the United States mails to defraud. They were also tried under the New York State statute for counterfeiting.

Commerce of the St. Mary's Falls Canal.

We condense the following figures from some elaborate statistics of the traffic of the St. Mary's Falls Canal, which have been recently issued. The original tables show the commerce through the canal for each calendar year since its opening in 1855

Year.	Total passag's.	Registered tonnage.	Coal. Net tons.	Flour. Barrels.	Wheat. Bushels.	Grain—other than wheat. Bushels.	Manufactured and Pig iron. Net tons.	Copper. Net tons.	Iron ore. Net tons.	Lumber, B. M., feet.	Total Freight. Net tons.
1885.....	5,380	3,035,937	894,991	1,440. 93	15 274,213	422 981	60,842	31 927	1,235,122	127,981,000	3,256,628
18 6.....	7,424	4 219,397	1.009.999	1,759,365	18,991,185	715.373	115,208	38.62[illegible]	2,087,8 9	136,688 00	4,527,759
1887.....	9,355	4.897,598	1 352,987	1.57 .735	23,093,520	775,166	74,9:9	34.836	2,497.713	155,.26 000	5,494.649
1888	7.8 3	5,130,659	2 105,04[illegible]	2.190,725	18.593,351	2,022,308	63,708	28,940	2,570,517	249,372 000	6.411,423
1889.....	9,579	7.221,935	1,629 197	2,228,707	16.231,854	2,133,245	57,561	33,456	4,095,855	315,.54,000	7.516,022
1890.....	10,557	8,454,435	2.176 925	3.249,101	16,217,370	2,044,384	116,327	43,729	4.771,768	361,929.000	9,041 213
1891.....	10.191	8,400,685	2,507.532	3 780,143	33.816,570	1,032,104	69,741	69,.90	3,560 213	366,305,000	8.888,759
1892.....	12,580	10,647.203	2,904,266	5.418,135	40,994,730	1.666,690	101,520	64,993	4 9 1,132	512,814,00	11.21[illegible],833
1 93.....	12,008	8,949.754	3,008,120	7.420,674	43.181 652	2,400,344	89,452	87,51[illegible]	4 014 556	588 545,000	10 796,572
1894	14,491	13,11[illegible] 366	2.797.184	8,965.773	34,839,183	1 545.008	60,65[illegible]	99,.73	6 548,876	722 7[illegible]8,000	13,195,860
1895	17,956	16,606,781	2 574,362	8,902,302	46,218,250	8,328,694	100,337	107.452	8,062.209	740,700,000	15,062,580

The traffic through the Canadian Canal, which was opened to commerce Sept. 9, 1895, is included in this statement for the season of 1895.

The estimated value of the items of freight carried since 1887 are shown and also the lake freight rates to and from Lake Superior, total mile tons, cost of transportation and cost of carrying per mile-ton for 1887 and following years. From these figures it appears that the value of freight carried was $79,031,757 in 1887 and $159,575,129 in 1895. The total mile-tons in the latter year was 12,592,548,892, three times as great as in the earlier year named. The cost of carrying per mile ton has fallen from 2 3 mills in 1887 to 1.14 mills in 1895. The average journey has slowly increased, being 811 miles in 1887 and 830 miles in 1895. The freight rate on iron ore was $1.75 per net ton in 1887 and 82 cents in 1895, which was higher than in the two previous years, the rate obtained in 1894 having been 70 cents and in 1893 80 cents.

National Association of Manufacturers.

Mr. Theodore C. Search, President of the National Association of Manufacturers, issued a circular on June 17, reviewing the progress which has been made since its organization. The membership seems to be rapidly increasing, and seven new state vice-presidents have been appointed since the February meeting.

A bureau of publicity has been established at 1751 North Fourth street, Philadelphia, Pa., where it is under the direct supervision of the President of the Association, and at this bureau all the reading matter relating to the Association is prepared and published for circulation among the manufacturers of the United States. The action taken at the last annual convention in reference to consular reform has been embodied in a circular letter and sent to every member of Congress. The Association is taking an active part in the movement for the establishment of a classification of freight which shall be uniform throughout the United States. It has undertaken to organize a party of leading manufacturers in various lines, to visit South America for the purpose of making a study of trade conditions. A committee of three, appointed at the last annual convention, visited Mexico last April, to investigate our trade relations with that country, and they are to make their report to the members of the Association. The Association is also undertaking to establish agencies in foreign countries for the representation of the American manufacturers, and has already gained a foot-hold for this purpose in Venezuela.

South American Notes.

The Venezuelan Government is said to be endeavoring to commute the unpaid guaranteed interest on the capital of the Central Railway Co. for $325,000, the amount now due aggregating $1,000,000. A protest has been sent to the President of Venezuela, and a petition to Lord Salisbury, by the management of the road. In this it is pointed out that the German Railway, from Caracas westward, received $5,200,000, in settlement of arrears amounting to $1,400,000, and in commutation of future guarantee. This result was accomplished through the intervention of the German Government.

The state of Para, Brazil, has offered handsome bounties to planters for setting out orchards of cocoa, coffee and rubber trees.

The Paulista Railroad has declared a dividend of 18 per cent. for 1895, and has carried forward 800,000 milreis.

Mr. Sigwald Muller, a German engineer acting under instructions from Messrs. N. M. Rothschild & Co., is making a survey for the long-projected extension of the Guayaquil-Chimbo Railroad to Quito, the capital of Ecuador.

The Peruvian Senate has authorized the Government to make a contract for the construction of a railroad from Oroya to Chauchamayo, with a grant to the contractors of 70,000 acres of land. As this is a work which the Peruvian Corporation, Ltd., should naturally undertake, it is doubtful if responsible contractors can be found to take the preferred concession.

At the coming Central American Exhibition to be held in Guatemala from March 15 to July 15, 1897, it is said that special prominence will be given to machinery for railroad contractors, for coffee plantations and for sugar plantations. It is furthermore pointed out that there is a growing demand in Central America for dairy appliances, electric light and power plants, bicycles, etc., which should also be well represented at the exhibition.

A Convention Souvenir Helps a Charitable Fund.

The souvenirs of the Peerless Rubber Manufacturing Co. distributed at the Master Car Builders' and Master Mechanics' conventions at Saratoga were pocket knives. But, to avoid the superstition connected with the gift of knives, the representatives of the company received a nominal sum for each knife. The total amount so collected was $34.66, which has been turned over to the Fresh Air Fund of the New York *Tribune*.

Ocean Records.

On their last westward trip, the American Line steamship St. Paul and the Cunarder Lucania each beat its best previous record for a single day's run by making 540 and 562 knots, respectively, in 24 hours. The St. Paul thus beat her former record for a day by 18 knots, while the Lucania did two knots better than she had ever done before. Each vessel holds a record, one for the Southampton course and the other for the Queenstown route.

Lord Kelvin's Jubilee.

An anniversary has recently been celebrated in the city of Glasgow which should have great interest to scientific men and to scholars all over the world. It was the fiftieth anniversary of the professorship of Sir William Thomson, now Lord Kelvin, in the University of Glasgow. He became Professor of Natural Philosophy there at the age of 22, having graduated from Cambridge at 21. It would be useless to attempt to give in a paragraph any review of the immense services to science which Sir William Thompson has rendered. As an experimenter, an inventor, a writer and a teacher, he stands among the first men of the century and the civilized world has delighted to join in honoring him in this jubilee celebration.

South American Notes.

The announcement is made that a Chilian corporation will soon have a fleet of powerful tug boats in service for towing sailing ships through the Straits of Magellan. This will effect a saving in distance for sailing vessels passing around South America of some 2,000 miles, and relieve them from the most perilous portion of their voyage.

The Mogyana Railroad, of Sao Paulo, Brazil, owned and operated by Brazilians, reports gross income for 1895 at 13,285,321 *mil reis*, and expenses at 8,327,717 *mil reis*. Taking exchange at an average of 23 cents, this would show net earnings of $1,140,249. The length of the Mogyane lines now aggregates 685 miles, and an extension is being pushed on toward the State of Goyaz, in the valley of the Araguaya, a tributary of the Amazon.

The Amazon Steam Navigation Company has paid a dividend of 6 per cent. for 1895, the amount thus disbursed being $151,570. The fleet is being increased by the addition of nine new vessels, a portion of which will be assigned to traffic on the Rio Araguaya, a new venture for this company. Two of the new vessels are intended for service up the Amazon to Iquitos, in Eastern Peru.

On the 23d of last April the steamship Huascar arrived at Iquitos, Peru, from Havre, France. This is the first ship of the new line just established by Sr. Carlos Mouraille, of Iquitos, to ply direct from that port to France. This is an enterprise of striking interest, demonstrating the claim long made by Peru to belong as well to the maritime nations of the Atlantic as the Pacific. Iquitos is situated in the montana of Peru, 2,400 miles from the mouth of the Amazon. The practicability of the voyage up the river for ocean-going vessels was first proved by Sr. Mouraille in 1893, when he loaded the steamer Spero, 1,200 tons burden, and brought her in safety to this inland port. The chief products of the region served are rubber and tobacco, to which may now be added rice and coffee. The gold fields of the region just beyond Iquitos are also attracting attention.

The message of President Uriburu, of Argentina, calls attention to the circumstance that the surveys for a railroad connection to Rioja have been finished, and Congress is asked to appropriate money for its construction.

Incorporation of the Cataract Power & Conduit Co.

The Cataract Power & Conduit Co. of Buffalo has been incorporated in New York with a capital stock of $2,000,000 to distribute heat, light and power in Buffalo, with power generated at Niagara Falls. The directors are John Jacob Astor, Daniel O'Day, E. D. Adams, Francis L. Stetson, Edward L. Wickes, William B Rankine and D. O. Mills, of New York; George Urban, Jr., and Charles R. Huntley, of Buffalo.

LOCOMOTIVE BUILDING.

Orders for the construction of five "Class R" locomotives have been received in the Erie shops at Susquehanna, Pa.

The Georgia & Alabama has given an order to the Richmond Locomotive Works for six new locomotives, four for freight and two for passenger service.

CAR BUILDING.

The Delaware, Lackawanna & Western is in the market for 1,200 cars.

The Grand Trunk is said to be contemplating orders for over 4,000 cars.

The Southern Car Line, with headquarters at Atlanta, Ga., will shortly build about 2,200 freight cars.

The Illinois Central is reported to be in the market for 1,800 cars in addition to the orders for new equipment given out recently.

Orders have been given to the Pullman Car Company by the Chicago Great Western for a new dining-car for use on its Chicago division.

The Baltimore & Ohio will shortly order a number of combination cars. The exact number to be built has not yet been decided upon. No other additions to the passenger equipment are contemplated at present.

BRIDGE BUILDING.

Biddeford, Me.—Report says that the County Commissioners have decided to rebuild the bridge over the Saco River at this place.

Belleville, Ill.—An iron bridge, to cost about $1,400, is to be built over Hawk Creek, in Lebanon Township.

Binghamton, N. Y.—Mr. Charles F. Stowell, Consulting Engineer to the Railroad Commissioners of New York, has examined the Ferry street suspension bridge over Chenango Creek and has declared it unsafe. The bridge was strengthened some years ago in order to run electric cars over it, but the strengthening was not carried to the degree recommended and heavier cars than was intended are being run over the structure. The stiffening trusses are badly out of shape and the main cables are a good deal rusted at the anchorages. Mr. S. E. Monroe, City Engineer, has also reported to the City Council that the bridge is not in condition to carry the load imposed upon it.

Boston.—The Boston Transit Commission will receive bids until July 21 for building ten masonry piers for Charlestown Bridge. Plans, etc., can be seen at the office of the City Engineer, City Hall. B. Leighton Beal is Secretary of the commission.

Carthage, N. Y.—State Superintendent of Public Works Aldridge has awarded the contracts for the iron bridge over Black River at this place, as follows: Substructure to Dunfee, Belden & Co., Syracuse, for $4,916; superstructure, Buffalo Bridge & Iron Works, for $15,170.

Chattanooga, Tenn.—It is reported that the contract for the iron work of the White street bridge has been given to the W. H. Converse Bridge Co., of this city, for $6,000. W. T. Curley has the contract for the masonry at $3.95 per cubic yard.

Cumberland, Md.—The Grant County (W. Va.) Court has agreed to build an iron bridge across the North Branch River, at Bayard, provided the Commissioners of Garret County, Md., will pay one-half the cost of the bridge.

Elmira, N. Y.—The Board of Public Works proposes to build an iron bridge across Hoffman Creek, at West Church street.

Galveston, Tex.—Harris and Galveston Counties have signed a contract with the Chicago Bridge and Iron Co. for a joint steel bridge over Clear Creek, the price being $3,837.

Milwaukee, Wis.—The Board of Public Works, having received bids for the second time for the sub-structure of the drawbridge at Huron street, have given the contract to William Forrestal for $24,300, it is stated. Other bidders were James Markey, $25,870; P. F. Kelly, $26,250; A. F. Bues, $27,300; William T. Duke, $24,689, and Robert Love, $24,736, all of Milwaukee.

Minneapolis, Minn.—The contract for the superstructure of the proposed Seventh street viaduct has been given to the Gillette-Herzog Manufacturing Co., of this city, at its bid of $31,485.

Press reports state a committee of the Park Board has recommended an appropriation of $2,000 for a steel bridge over Minnehaha Creek, at Nicollet avenue.

Monterey, Wis.—Press reports state that the Chicago & Northwestern will build an iron bridge over Rock River at a cost of about $40,000.

New York.—The Commissioners of Public Works have received permission from the Board of Estimate to spend $5,000 on preliminary plans for the proposed bridge over the Harlem River on the Kingsbridge Road.

Norristown, Pa.—At a special meeting of the County Commissioners, on June 25, the contract for the iron work on the Airy street bridge was awarded to the Pencoyd Iron Works, Philadelphia, at its bid of $22,776.

It is reported that the contracts for the four small iron bridges were awarded to John Dennithorn & Son, of Phœnixville.

Pittsburgh, Pa.—The President has signed the bill authorizing a bridge on the Butler & Pittsburgh over the Allegheney River at Harmarville, and plans have been completed for the same. It will be 3,000 ft. long and about 120 ft above the river.

Sixteen bidders have filed their proposals for building the bridges in Schenley Park, as follows: Gooch, Rinehart & Dennis, Carnegie Steel Co., G. T. Richards, Joseph Geanini & Verik, Pennsylvania Bridge Co., C. T. McDonald, Keeling & Ridge, Clark Bros., Youngstown Bridge Co., the King Bridge Co., Jacob Friday, Keepers & Thatcher, Howley & O'Rourke, C. M. Driver, Nuld & Foley, and the Schultz Iron and Bridge Co.

Troy, O.—It is stated that bids are asked until July 17 for building a high-truss iron bridge over Panther Creek. N. C. Tisdel is County Auditor.

Uniontown, Pa.—The Council has decided to erect two new bridges over Coal Lick Run.

Warren, Pa.—Work has been begun on the new double-track three-span iron bridge over the Allegheny River on the Philadelphia & Erie at this place. The new bridge will be 475 ft. long. The contract for the iron work has been let to the Pencoyd Iron Works, Philadelphia, for $40,000. The contract for the stone masonry has been let to John D. Kelley, of Williamsport, for about $15,000. The entire bridge will cost about $60,000.

Westbrook, Me.—The City Council has awarded the contract for the new iron bridge over the Presumpscot at Cumberland Mills to the King Bridge Co., Cleveland, O., for $4,796.

MEETINGS AND ANNOUNCEMENTS.

Dividends.

Dividends on the capital stocks of railroad companies have been declared as follows:

California Eastern, special, rooms 439 to 442 Equitable Building, Denver, Colo., July 24.

Chicago, Rock Island & Pacific, quarterly, ½ per cent., payable Aug. 1.

Cincinnati, Portsmouth & Virginia, 2 per cent. on preferred stock, payable July 1.

Delaware, Lackawanna & Western, 1¾ per cent., payable July 20.

Denver, Lakewood & Golden, annual, company's office, Boston Building, Denver, Colo., July 6.

Fitchburg, 2 per cent. on preferred stock, payable July 15.

Georgia Railroad & Banking Co., quarterly, 2¾ per cent., payable July 15.

Granite, $2, payable July 1.

Little Schuylkill Navigation, Railroad & Stock Co., 3½ per cent., payable July 8.

Lake Shore & Michigan Southern, semi-annual, 3 per cent., payable Aug. 1.

Michigan Central, 2 per cent., payable Aug. 1.

Northern of New Jersey, 2 per cent., payable July 15.

Petersburgh, 3½ per cent. on the common and preferred stock, payable July 1.

Pittsburgh, Fort Wayne & Chicago, quarterly, 1¾ per cent, on the guaranteed stock, payable July 7, and a special quarterly dividend of 1¾ per cent. on the guaranteed stock, payable July 1.

Richmond, Fredericksburgh & Potomac, 3½ per cent. on the common stock, payable July 1.

Richmond & Petersburgh, 3½ per cent., payable July 1.

Rock Island & Peoria, 2½ per cent., payable July 1.

St. Louis, Alton & Terre Haute, semi-annual, 1⅛ per cent, payable July 1.

Worcester, Nassau & Rochester, 2½ per cent., payable July 1.

Stockholders' Meetings.

Meetings of the stockholders of railroad companies will be held as follows:

New York & Harlem, special, Grand Central station, New York City, July 15.

Saginaw Valley & St. Louis, annual, company's office, St. Louis, Gratiot County, Mich., July 8.

Saginaw & Western, annual, Alma, Gratiot County, Mich., July 8.

West Virgina & Pittsburgh, annual, Weston, W. Va., Aug. 11.

PERSONAL.

—Mr. S. J. Cassetry, of Evansville, Ind., has succeeded Mr. Francis H. Willard as General Agent of the Peoria, Decatur & Evansville road.

—Mr. Phillip Allen has been appointed Superintendent of the Kalamazoo division of the Lake Shore & Michigan Southern road to succeed the late A. G. Amsden.

—Mr. William J. Dale, Jr., has been re-nominated a State Railroad Commissioner of Massachusetts for another term of three years, beginning July 1, and the nomination of the Governor has been confirmed by the Executive Council.

—Mr. Henry G. Morse has accepted the Presidency of the Harlan & Hollingsworth Company, iron ship and car builders, succeeding Mr. W. Taylor Gause, resigned. Mr. Morse was formerly President of the Edge Moor Bridge Works.

—Mr. Charles E. Heard, Chief Train Dispatcher of the Western & Atlantic Division of the Nashville, Chattanooga & St. Louis Railroad, died in Atlanta, on June 23. Mr. Heard had been in the service of the Western & Atlantic for a number of years.

—Hon. John E. Sanford, Chairman of the Massachusetts Board of Railroad Commissioners, is now a Doctor of Laws, that degree having been conferred upon him by Amherst College at the commencement exercises last week. Mr. Sanford was graduated from Amherst in 1851.

—Mr. Robert H. Berdell, who died at his home in New York last week, in the 76th year of his age, was at one time prominent in railroad affairs. He was elected President of the Erie system Aug. 10, 1864, and retained that office until October, 1867, when he was succeeded by Jay Gould.

—Mr. Joseph Richardson, General Passenger Agent of the Florida East Coast Railroad, was elected Commissioner of the Southern States Passenger Association at a meeting of the association in New York City on June 30. Mr. Richardson succeeds Mr. William B. Thomas, who resigned the office of Commissioner on June 15.

—The jurisdiction of Mr. T. P. Sweeley, Master Mechanic of the Crestline shops of the Pennsylvania Co., has been extended so as to include the shops at Toledo, Ohio, of which Mr. M. W. Lowe, who recently died, had charge. Mr. Sweeley at one time was foreman of the locomotive department of the shops at Columbus (Ohio).

—Mr. George F. Bidwell, Superintendent of the Ashland Division of the Chicago & Northwestern, has been made General Manager of the Fremont, Elkhorn & Missouri Valley lines, to succeed Mr. Horace G. Burt, who takes the place of Edwin W. Winter, General Manager of the Chicago, St. Paul, Minneapolis & Omaha line, recently elected President of the Northern Pacific.

—Mr. William W. Chandler, General Agent at Chicago of the Star Union Line, died on June 28 last, aged 76 years. Mr. Chandler was one of the oldest railroad men in the West, having been located at Chicago in railroad work for the last 34 years. Since 1864 he had been General Agent of the Star Union Line. Mr. Frederick Chandler, Soliciting Agent for the Wabash road in New York City, is a son.

—Mr. Horace G. Burt, General Manager of the Fremont, Elkhorn & Missouri Valley System, is to succeed Mr. E. W. Winter as General Manager of the Chicago, St. Paul, Minneapolis & Omaha Line. The Fremont, Elkhorn & Missouri Valley road is controlled by the Chicago & Northwestern, and Mr. Burt has been its General Manager since 1888. Previously he was Chief Engineer of the Chicago & Northwestern.

—Mr. George S. Morison, Past President of the American Society of Civil Engineers, was the Phi Beta Kappa orator at Harvard this year. His oration was much on the lines of the admirable address delivered by him before the American Society of Civil Engineers, at the summer convention at Hull (Boston Harbor) a year ago. The Phi Beta Kappa oration, however, takes up the central idea of the new epoch into which humanity has entered by beginning to manufacture power, and treats of the work of the University as affected by that idea. The whole thought running through the oration is lofty and it is developed with great dignity and weight.

—Mr. John M. Turner, formerly with the Illinois Central, but recently with the New Orleans & Western road, a new terminal line at New Orleans, has been appointed General Manager of the latter road. This appointment is due to the resignation of Mr. A. W. Swanitz, who has been General Manager and Chief Engineer of the road during its construction, to go to the Charleston & Macon, a new road in South Carolina, as General Manager. Captain Turner was located at New Orleans for a good many years as Superintendent of the Southern lines of the Illinois Central. After leaving this position he went to the South Carolina road as Superintendent and some time ago returned to New Orleans as Superintdent of Transportation of the New Orleans & Western. Mr. E. B. Beason, who has been connected with the company for some time, has been appointed Chief Engineer.

—Mr. Ambrose S. Beverly, President of the Boston & Lockport Block Co., and of other large manufacturing companies, died at Rochester, N.Y., on June 25, after an operation. He was in his seventieth year. Mr. Beverly had a long and active business life and had been associated with industries at Lockport, N. Y., since 1847. For many years, until 1886, he conducted a large hardware store in that town. Since that time he had given most of his time to the management of various companies in which he was interested. Besides being President of the Boston & Lockport Block Co., he was President of the Lockport Hydraulic Co., and of the Niagara White Grape Co.; Vice-President and Treasurer of the Lockport Pulp Co., and had interests in the Franklin Mills Co., Lockport Felt Co. and other manufacturing concerns. He was one of the chief citizens of the town in which he had so long resided and was Mayor in 1881 and 1882.

—Mr. Theodore Delevan Wilson, formerly Chief Constructor of the United States Navy, died of apoplexy June 29, at the Charlestown Navy Yard, while superintending work on the monitor Passaic. Mr. Wilson was born in Brooklyn, N. Y., in 1840, and served an apprenticeship as a shipwright in the Brooklyn Navy Yard, under Naval Constructor B. F. Delano. He served through the civil war the first year in New York Regiment, and afterward in the navy. He remained in the naval service, and had charge of the construction departments of several navy yards, also serving four years at Annapolis as instructor in ship building. On July 1, 1873, he was commissioned a naval constructor, and was sent the following year to the Portsmouth Navy Yard. On March 1, 1882, he became Chief Constructor of the Navy, and held that office until July, 1891, when he resigned, owing to ill health. During his term at Washington as Chief Constructer, Mr. Wilson was directly identified with the designing of nearly all the new ships for the navy.

ELECTIONS AND APPOINTMENTS.

Alton Terminal.—E. M. Stanton has been appointed Car Service Agent of the company, with headquarters at Springfield, Ill. He succeeds D. C. Fredericks, resigned.

Atlantic & Pacific.—C. W. Smith, Receiver, has moved his headquarters from Albuquerque, N. M., to Chicago. Don A. Sweet, agent for the Receiver, will remain in Albuquerque.

Cincinnati, Hamilton & Dayton.—Perry Griffin, City Passenger and Ticket Agent at Cincinnati, has been appointed Gederal Southern Agent of the Passenger Department, with office at Cincinnati.

Georgia Midland.—This road is now operated as a part of the Southern Railway system. All balances for car mileage, freight and ticket accounts, and all bills and claims in favor of or against the Georgia Midland Railway Company originating on and after July 1, 1896, will be settled by the Southern Railway Company and should be included in their accounts. The jurisdiction of the following officers of the auditing department has been extended over the line: G. S. Hobbs, Auditor; J. W. Morrow, Auditor of Disbursements; J. J. Wingfield, Ticket Auditor; H. W. Woolf, Freight Auditor; H. I. Bettis, General Assistant, and W. O. Knight, Traveling Auditor.

Lafayette & Monon.—The annual meeting of the stockholders of the company was held at Lafayette, Ind., on June 20, the following directors being elected: W. H. McDoel, J. F. McHugh, Fred Hall, James Murdock, T. H Parker, J. F. McDoel, W. F. Stillwell, W. H. Lewis and Adam Earl. The directors elected the following officers: President, James Murdock; Vice-President, W. H. McDoel; Secretary and Treasurer, W. H. Lewis. The road is controlled by the Louisville, New Albany & Chicago.

Lehigh Valley.—Mr. Leonard Goodwin, Assistant Trainmaster of the Lehigh Division and the Easton & Amboy road, having been transferred to the Elmira & Cortland Branch of the Auburn Division, the office of Assistant Trainmaster on the first named division ha been abolished.

Louisville, Evansville & St. Louis.—The Receiver and General Manager Mr. Geo. T. Jarvis, removed his office from Evansville to Louisville on July 1, and at the same time the offices of Treasurer Heberd and Auditor McGuire were removed to Louisville. The headquarters of the operating department will remain at Princeton, Ind., and the traffic department will remain in St. Louis

New Orleans & Western.—J. M. Turner, formerly Superintendent of Transportation and Motive Power, has been appointed General Manager. C. B. Deasom, formerly Mechanical Engineer and Assistant Chief Engineer of the road, succeeds Mr. A. W. Swanitz as Chief Engineer.

Oregon Railway & Navigation.—At a meeting of the stockholders, held in Portland, Or., the following new Board of Directors was chosen: D. P. Thompson, W. T. Burrell, B. Campbell, J. N. Teal, L. B. Cox, F G. Wheeler, E. S. Benton, W. H. Hurlburt, C. F. Adams, R. H. Jenkins, G E. Withington, R. L. Sabin. Thomas G. Greene, all of Portland. The following officers were elected, the election of President being deferred: Thomas G. Greene, C. F. Adams and W. F Burrell, Vice-Presidents; G. E. Withington, Treasurer; E. S. Benson, Comptroller; J. N. Teal, Secretary, and R. H. Jenkins, Assistant Secretary. The election is for the purpose of effecting a reorganization of the company.

Plant System of Railways.—J. B. Cutler has been appointed Master of Trains of the Fifth Division of the Plant System, vice Mr. L. F. Hennington, transferred. The office of Assistant Master of Trains has been abolished.

St. Lawrence & Adirondack.—The directors of the consolidated company are: William Seward Webb, Chauncey M. Depew. Edgar Van Etten, John Jacob Astor, Frank G. Smith, Charles H. Burnett and Henry L. Sprague, all of New York City, and Martin E. McClary, of Malone, N. Y., and Edward C. Smith, of St. Albans, Vt. Mr. Webb is the President and Chauncey M. Depew the Vice-President of the new company.

St Louis, Peoria & Northern.—The St. Louis, Peoria & Northern has acquired the title to the St. Louis & Eastern Railway, St. Louis & Peoria Railroad and the North & South Railroad of Illinois (formerly known as St. Louis & Chicago R. R.), and assumed the management, operation and accounts of those companies on July 1.

Southern States Passenger Association.—At a meetting of the association, held in New York City, June 30, Joseph Richardson was elected Commissioner, to succeed William Bailey Thomas, resigned. Mr. Richardson has been General Passenger Agent of the Florida East Coast road, and was a member of the Auditing Committee of the association.

RAILROAD CONSTRUCTION,
Incorporations, Surveys, Etc.

Bangor & Aroostook.—Important improvements are to be made on the road this season, especially on the Moosehead Lake Division; $60,000 will be expended on reballasting the track on this division.

An engineering party has been making the surveys for a branch line, from Island Falls to the head of Mattawamkeag Lake, Me., a distance of 2½ miles.

Brookville.—This road, recently incorporated in Pennsylvania, is to be built as a branch of the Allegheny Valley road, and will be operated by that company when completed. Active work is to be begun at once. It is expected that the rails will be laid before winter. The road is to be built chiefly for the transportation of timber and bark from a large timber tract in Polk County to Brookville, Pa., and will be 13 miles long.

California.—This line, running from Oakland to Laundry Farm, Cal., was formally opened on June 12. The line is now being operated on a regular schedule.

Chesapeake & Ohio.—The Common Council of the city of Richmond has authorized the extensive terminal improvements at Richmond, Va., which the company has long contemplated. This involves the expenditure of a very large sum in viaducts, yards and station buildings.

Chicago & Eastern.—Articles of incorporation for this road were filed at Indianapolis only two weeks ago, but the projectors state that the surveys will be made at once. The road is to extend from East Chicago into Elkhart County, Ind. The directors are Robert B. Muir, W. A. Jones, Frank Richardson, E. R. Gouger, W. J. Yates, B. F. Huber and H. S. Oakley.

Chicago & Northwestern.—The officials of this road have accepted the ordinances recently passed by the City Council of Manitowoc, Wis., granting them the right to construct a belt line around the city, and also to build a track on Quay and Franklin streets, to the lake front, to the Flint and Pere Marquette docks. The changes will involve a large expenditure.

Chicago, Burlington & Quincy.—The company has awarded to the Edwards & Walsh Construction Co., of Clinton, Ia., the contract for grading a line of road four miles in length, from New Windsor, Ill., to the Griffin tile works.

Chicago, St. Paul, Minneapolis & Omaha.—The company commenced building a road across the Missouri River at Sioux City, Ia., beginning above the Pacific Short Line bridge and going east through Covington. The spur will be about one mile and a half in length. The chief use of the new line at present will be to carry along the river bank the 500 carloads of stone which will be used in the government riprap work.

Cincinnati, Hillsboro & Western.—The engineers of the road are making rapid progress with the survey, and are now working near Hillsboro, O. The road passes through the counties of Jackson, Pike, Highland, Brown and Clermont, to Cincinnati. From Hillsboro east it will run on a survey made in 1852. West from Hillsboro its course will be over the old Fayetteville survey to Milford.

Cleveland & Southwestern.—The surveys are now being made for this road between Cleveland and the western line of Ohio. Right of way is also being secured. G. M. Anderson, of Detroit, Mich., and D. R. Cook, of Hastings, Mich., have opened right of way headquarters at Spencerville, O. The proposed line will pass through Elyria, Norwalk, Tiffin, Lima, Spencerville, Portland and Anderson. Thomas H. Beer, of Bucyrus, is President.

Duluth & Southwestern.—This company filed articles of incorporation at St. Paul on June 24. The company is organized to build or lease roads giving a line from the southern boundary of the state through Red Wing to Duluth The incorporators are Charles H. Graves, George W Buck, Percy S. Anneke and W. Buchanan, of Duluth, and ex-Governor L. F. Hubbard, of Red Wing, Minn., some of whom have been interested in the Duluth, Red Wing & Southern.

Florence & Cripple Creek.—The new high leve track of this road, in Moffat Canon, has been completed and is in operation. The total cost of the work will be about $250 000. The route for several miles through the canon, now occupies a shelf, blasted from the solid rock wall, about 10 to 30 ft. above the stream, and was built to prevent the washing out of the roadbed, which has happened each year since the line was built. The new line was constructed by Carlisle & Dittman, of Pueblo. In all, nine miles has been rebuilt.

Gray's Point Terminal.—The stockholders of this new Missouri company are to meet at St. Louis on Aug. 31 to authorize the directors to issue first mortgage bonds to the amount of $500,000. The company has been organized to build a line of 15 miles from Delta, in Cape Girardeau County, Missouri, in an easterly direction to Gray's Point on the Mississippi River, in Scott County, just below St. Louis. S. C. Johnson, as Secretary of the company, has issued the present notice for a stockholders' meeting.

Guatemala Colonization.—A dispatch from Coatzacoalcos, Mexico, states that preparations have been made by the company for the immediate construction of a road connecting the Tehuantepec National Railway with the city of Guatemala. The company has just made a guarantee deposit of $50,000 in 3 per cent. bonds of national consolidated debt with the National Treasury of Mexico that the terms of the concession will be carried out.

Illinois Central.—A second track is now being built on the line through Illinois from Bosky Dell, on the north, to Dongola, on the south, a distance of about 27 miles. The grading of five miles is under contract to Mr. J. D. Lynch, and the remainder to McArthur Bros. Co., of Chicago. The J. S. Paterson Construction Co., of Chicago, has the contract for the masonry and culvert work, and the American Bridge Works, of Chicago, for the steel bridge structures. It is expected this work will be completed about Oct. 1. The maximum grades on this double track are 30 ft. to the mile, and the maximum curvature 4 deg. This portion of the line runs through the hill country in Southern Illinois. This work is being done under the general direction of Mr. J. F. Wallace, Chief Engineer, whose headquarters are at Chicago The work is in the immediate charge of Resident Engineer J. P. Coleman, who reports to Assistant Chief Engineer David Sloan.

Indiana Central.—The citizens of Penn Township, Portland County, Ind., at a special election last week voted a subsidy of $17,000 to aid in building this road. This makes $200,000 county aid that has been voted. The survey has been completed from Huntington to Union City, and the engineers are now at Napanee, to continue the survey to Laurenceburg.

Intercolonial.—The company has opened its branch from Windsor Junction to Dartmouth and Waverley. N. S. The line is 10 miles long and gives the Intercolonial a new entrance to Halifax, made necessary by the destruction of the bridge crossing Halifax Narrows, by which the road formerly entered the city of Halifax. It was decided to build the new branch to Dartmouth, opposite Halifax, instead of rebuilding the bridge. The branch was described in the *Railroad Gazette* of March 29, 1895.

Lake Superior & Ishpeming.—This company has laid 7½ miles of track this year on the main line between Lake Superior, near Marquette, Mich., and Dead River, to a point east of Lake Superior. It is the intention of the company to complete the tracklaying so far as the iron ore mines in the Marquette range, in the vicinity of Ishpeming and Negaunee, as soon as the iron bridge across Dead River is completed. John M. Egan is Assistant to the President at Marquette, Mich.

Little Kanawha Valley.—Since Wood County, W. Va., voted to issue $175,000 bonds in aid of this road, and other counties through which it is to pass made smaller subscriptions, the enterprise has been taken up by Governor W. A. MacCorkle, General Manager Burt, of the Ohio River road; H. C. Jackson, President of the Parkersburg Chamber of Commerce, and the contracting firm of Drake, Stratton & Co. Engineers are in the field completing the surveys, and it is hoped to begin work within 60 days. There has been some difficulty about the bonds which Wood County voted, but that has been arranged, and the securities will be offered for sale within a few days.

Manistee & Grand Rapids.—The company has constructed during the present season an extension of 13.55 miles from the Chicago & West Michigan crossing, north of Manistee, to a point three miles east of Luther, all in the state of Michigan. The track was completed this week. The total length of this road is now 42.83 miles from Manistee to its eastern terminus, not including several branches. Heretofore it has been used exclusively as a lumbering road, but it is probable that passenger trains and a regular service will be put on. The money for its construction has all been furnished by its directors and it has no debts. With the exception of two truss bridges and one fill of 80,000 cu. yds, all construction work has been done by day labor under the direction of the superintendent and chief engineer. There is some talk of an extension to Castilac, but there is no certainty that it will be made. E. W. Muenscher, M. Am. So. C. E., Chief Engineer.

New Roads.—A project has been proposed at Covington, La., to build a road from that point to Ponchatoula, La., on the Illinois Central, a distance of less than 20 miles. At a meeting in Covington the business men agreed to subscribe $50,000 to the enterprise. It is stated that Mr. Harahan, Vice-President of the Illinois Central, has agreed to assist in the construction of the road in case a certain amount is raised in Covington. The object is to open up the timber country between Covington and the Illinois Central Road.

Engineers are surveying for a new road from Golden to Boulder Park, Colo., which, if built, would give a short line to Pine Creek, a new promising mining district producing low and medium-grade ore.

New York & Pennsylvania.—J. B Rumsey, of Oswayo, Pa., has the contract for the northern extension of this road and has commenced construction work at Rexville, N. Y. The road is to be built from that point to Canisteo, N. Y., a distance of 14 miles. The roadbed of the old Hornellsville & Pine Creek line will be used part of the way north of Greenwood. An entirely new roadbed will be built from Rexville to Greenwood on the west side of the valley and beyond that the old grade is in good condition most of the way to Canisteo. At Canisteo the company will secure an entrance to Hornellsville, N. Y., over the tracks of the Erie road.

Pennsylvania.—Considerable progress has already been made in the work of straightening the line at Mt. Joy, Pa. The new and shorter line will pass through the center of the town, the tracks being elevated above the line of the streets and all grade crossings done away with; a large amount of excavation has already been done, and the company will construct eight overhead bridges. A new passenger station will be erected. It is announced that the improvements at this point will not be interrupted, the recent order suspending new construction work not affecting this particular improvement.

St. Louis & San Francisco.—A charter for the new company was issued in Missouri on June 30, to the purchasers at the foreclosure sale on June 27. The capital stock is $50,000,000. The total tax is $37,517, as follows: Corporation tax, $25,095; certificate, $12; endowment tax, $12,500. The attorney for the company paid the endowment tax under protest. Suit will probably be brought to compel this money to be returned. The incorporators are: D. B. Robinson, H. L. Morrill, L. F. Parker and others.

San Diego & Yuma.—Articles of incorporation of the railroad company have been filed at San Diego, Cal. The capital stock of the company is $4,000,000. The company will ask for subscriptions to a guarantee fund of $480,000 to secure four per cent. interest on $4,000,000, the estimated cost of the road from San Diego to Yuma, Ariz.

San Francisco & San Joaquin Valley.—The stockholders of this road have authorized the issue of $6,000,000 bonds, to complete the line to Bakersfield and into San Francisco. Surveys have already been made. The entire distance between these points is 325 miles, of which 55 miles is now completed.

Sanpete Valley.—Secretary S. T. Pearson, of this road, reports that the work of widening the gage to standard will be completed this week. At the conclusion of the work all of the narrow-gage equipment will be stored at the Manti end of the route. The line is 41 miles long, extending south from Manti, on the Rio Grande Western, to Nephi, Utah.

South St. Louis.—The Secretary of State of Missouri has issued a certificate of incorporation to the South St. Louis Switch Railroad Company, with F. W. Heitz, Charles H. Grate and August W. Thies as incorporators.

Tennessee Central.—Since all work of construction on this road has been suspended, Receiver C. O. Godley has been in the East to meet the interests who agreed to supply the funds to complete the road. An expert is now examining the properties and proposed connections of the road, and, if his report is favorable, definite plans will be made for completing the road to Harriman, Tenn. The plans also include the purchase of the Nashville & Knoxville or Crawford road, making one line from Lebanon to Harriman. The Nashville connection is secured through the Nashville, Chattanooga & St. Louis.

Utah & California.—Mr. A. H. Cannon states that the affairs of this road are in excellent shape, and that its ultimate success seems to be assured. Grading west of Salt Lake City, on the Deep Creek line, has been stopped on account of right of way trouble in the vicinity of Tooele.

Whitcomb & Morris.—This company has been incorporated in Wisconsin with a capital stock of $10,000, to build a line six miles long between Morris, Wis., and Whitcomb, Wis., to connect with the Chicago & Northwestern at Whitcomb The incorporators are J. J. Sprague, Charles Barber, J. H. Jenkins and D. F. Birkstaff, of Oshkosh, and H. J. Sprague, of Morris.

Yosemite & Merced River.—The building of this road, which is to connect Merced, Cal., with the Yosemite Valley, will now be pushed rapidly. The grading will be divided into two contracts, one for each half of the road. The first contract to be given will cover the first 46 miles from Merced toward the Yosemite. The right of way for the entire line, except a short gap near Snelling, has been already secured.

Electric Railroad Construction.

Alameda, Cal.—The California Railway Co. has opened its line from the Park street bridge to Laundry Farm. The electric locomotive used is a duplicate, on a smaller scale, of that used on the Baltimore & Ohio road and weighs 30 tons. The locomotive ran very well for the first attempt, but a few minor alterations must be made in order to increase its power so that it may draw the trains up the steep grades.

Albany, N. Y.—The Albany Electric Railway Co. has asked the Council for a franchise to extend its tracks

through Bassett, Dallius and Alexander streets to the Helderbergs and Schoharie court house, a distance of about twenty miles.

Annville, Pa.—Surveys were made last week for an electric road from Annville to Hummelstown, a distance of about 10 miles.

Baltimore, Md.—Contracts have been awarded by the Columbia & Maryland Electric Railway Co. for the overhead work on the city portion of its line, extending from Howard and Saratoga streets to Calverton road and Edmondson avenue to Thomas C. Basshor, for the poles and to the Maryland Manufacturing and Construction Co. for the other material. A contract for 32, 100-H. P. motors and 20, 30 H. P. motors has been awarded to the Westinghouse Electric Co. The larger motors will be used on the through cars between Baltimore and Washington, and the smaller ones will propel the cars running between Baltimore and Ellicott City. The contract for building the power-house at Paint Branch, Hyattsville, has been awarded to Henry Smith & Son, of Baltimore, for $81,500. The power-house will be a brick structure, 205 ft. long and 130 ft. wide. The plans were prepared by Henry Brauns, architect.

The East Baltimore & Clifton Park Passenger Railway Co. has been incorporated to carry out the proposed extensions of the Suburban Co.

Boston, Mass.—The Hingham Street Railway Co. formally opened its lines between Boston and Nantasket Beach on June 15. The roadbed is excellently constructed and a 60-ft. rail has been used, weighing 58 lbs. to the yard. The first rails were laid three months ago, yet the company has in operation 14 miles of line, generating its own power and fully equipped. S. Reed Anthony, of Boston, is President of the company.

Doylestown, Pa.—All the right of way for the new electric road from Doylestown to Willow Grove has been secured. The tracks will be laid on the pike. Connections have already been made at Willow Grove with the road of the Traction Co. and switches have been laid. The road will be 24 miles long, and is expected to be finished this summer.

Hackensack, N. J.—It is stated that the Union Traction Co. has perfected arrangements with a contractor to build an electric road through Hackensack, and that they are now endeavoring to secure the consent of property owners along the proposed route.

Hagerstown, Md.—The City Council on June 23, granted the Hagerstown Railway Co. permission to occupy additional streets in Hagerstown.

Jackson, Tenn.—Arrangements have been completed for an electric railroad in the streets of Jackson. Work will begin very soon.

Johnstown, Pa.—The Roxbury branch of the Johnstown Passenger Railway Co. was completed last week. This line is about one and a half miles long, and has been built at an expense of about $20,000 to accommodate the traffic of the state fair, Sept. 7-12.

Joliet, Ill.—Negotiations are now in progress between William McKinley, of Champaign, and State Senator Macomber, of Augusta, for the purchase of the Joliet Electric Street Railroad from J. A. Henry, who has expended over $400,000 on the road.

New Brighton, Staten Island, N. Y.—The New Brighton Board of Trustees have granted to the Midland Railroad a franchise for an electric road in Richmond Turnpike, from Clover to Manor Road.

New York.—The New York & Queens County Railway Co. was incorporated June 26, with a capital stock of $2,500,000, to operate electric roads from and to points in Long Island City and to points in the town of Newtown. This company will be a consolidation of the Steinway Railway Co., of Long Island City, the Newton Railway Co., the Riker Avenue and Sanford's Point Railroad Co., and the Flushing & College Point Electric Railway Co. The Directors are Rudolph T. McCabe, Benjamin Orme, Walter Pease, of New York and Edward J. Matthews, Edward T. Stotesbury, Caleb F. Fox, William Shelmardine and R. E. Gowen, of Philadelphia.

The Third Avenue Railroad Co. has awarded the contract for the construction of its St. Nicholas avenue branch line to Isaac A. Hopper. The work includes the building of the road from 162d street to Kingsbridge, the construction of a large dock on the Harlem River, a brick and stone power-house, 100 × 100 ft.; a boiler house, 100 × 100 ft., and a car-house, 200 × 300 ft. The construction of the dock and car-house will be begun at once.

Philadelphia.—Work on the Fairmont Park Electric Railroad, which was begun six weeks ago, is being pushed ahead by 600 men. A deep cut, 1,600 ft. long, will be made at the Fifty-second street entrance to the park. In all, seven deep cuts have been made to tunnel under driveways, all of which will be carried over heavy masonry bridges and it is stated that not a driveway or footpath in the Park will be crossed at grade.

Pittsburgh, Pa.—The North Side Traction Co. has been chartered at Harrisburg with a capital of $15,000. Among the Directors are: G. T. Hamilton, President, T. W. Dieiker and H. T. Stern.

Plattsburgh, N. Y.—The State Board of Railroad Commissioners on June 22 granted an application of the Plattsburgh Traction Co. for permission to use electricity as a motive power.

Redlands, Cal.—It is proposed to build an electric road, to cost $175,000, from Redlands to the top of San Bernardino range north of that town.

St. Louis.—The Belleville Rapid Transit Co. has filed a certificate of incorporation with a capital stock of $300,000 to build an electric road from Belleville, Ill., to East St. Louis, a distance of about 12 miles. Among the incorporators are; George Silsby and William F. Stevens, of Saginaw, Mich.; George H. Wolton, of Chicago, and D. P. Alexander, of East St. Louis.

Santa Fe, N. Mex.—The Albuquerque Street Railway Co., of Santa Fe, has filed articles of corporation with a capital stock of $50,000. Among the incorporators are: Oliver E. Cromwell, of New York; A. A. Trimble and E. S. Stover, of New Mexico.

Scranton, Pa.—The Scranton Traction Co. opened its belt line in Hyde Park, on June 22, as far as the tracks are completed. It intends to double track Lackawanna avenue from Franklin avenue to Ninth street.

Shamokin, Pa.—The grading of the Maysville branch of the Shamokin electric street railroad has been completed and the work of laying the tracks was commenced on July 1. The trestle at Brady is being constructed. It is expected that the branch will be completed by August 1.

Seattle, Wash.—About 50 men are at work building the extension of the line of the Seattle & Rainier Beach Railway Co., from Rannier Beach to Renton. It will skirt Lake Washington and cross the Cedar River at Renton.

Sioux Falls, S. Dak.—The Sioux Falls Transportation Co. has been incorporated for the purpose of building four or five miles of electric railroads in Sioux Falls.

Waterbury, Conn.—On June 22 the Board of Aldermen passed an order granting the Waterbury Traction Co. permission to extend its lines in various directions. Work has been begun on the extensions of the lines.

Wilmington, Del.—The Wilmington City Railway Co. has been granted permission to extend its tracks down Pine street from Fourth to Third and thence to the bridge.

Worcester, Mass.—Rails are being laid for the new electric road as far as the cemetery on Main street, from the station at Sandersdale.

Youngstown, O.—The track-laying on the Cleveland and Chagrin Falls electric road has been begun. It is now graded to the town line of Orange from Cleveland.

GENERAL RAILROAD NEWS.

Baltimore & Ohio.—Receiver John K. Cowen states that the semi-annual dividend of three per cent. on the $3,000,000 of preferred stock, due on July 1, will not be paid. The receivers, however, will pay interest, aggregating over $200,000, due July 1.

California & Nevada.—The Central Trust Co. of New York has commenced suit in the United States Circuit Court at San Francisco, against the company for $367,050, alleged to be due for interest on bonds issued in 1884. A new receiver is asked and the suit includes foreclosure. The road is a narrow-gage line 23 miles long, from Oakland to Bryant's, Cal. It is leased and operated by the Oakland & San Francisco Terminal Co.

Canadian Pacific.—The earnings for May were as follows:

	1896.	1895.	1894.
Gross earn	$1,724,869	$1,441,423	$1,450,489
Oper. exp	1,037,379	896.774	936 951
Net earn	$687,490	$544,649	$513 538
P. c. exp to earn	60¾	62	64¾
Net 5 mos	1,484,903	1,941,963	1,849,273

The net earnings in May, 1893, were $509,585; in 1892, $600,984; in 1891, $589,639; in 1890, $467,965.

Chicago & South Side Rapid Transit.—A decree was entered in the State Court at Chicago, on June 29, providing for the sale of this road, better known as the "Alley L." The decree provides for the foreclosure of the first and second mortgage bonds, which aggregate $10,500,000, and the upset price is placed at $4,000,000. The road probably will be bought in by the reorganization committee. Master in Chancery Hull will later fix the date.

Chicago, Burlington & Quincy.—The report of May earnings, including those of the Chicago, Burlington & Northern, are reported as follows for four years:

	1896	1895.	1894.	1893.
Gross earn	$2,451,618	$2,611,858	$2,655,695	$3,514,843
Oper. exp	1,822,465	1,754,150	1,844,047	2,322,491
Charges	880,000	872,954	855,247	880,880
Deficit	250.846	15,246	43.599	net 311,472
5 mos. gr. earn	12,867.540	12.172,043	13,462.658	16,693.385
Oper. exp	8,677,681	8,254.229	8.811,525	11 580,389
Charges	4,400,000	4,364,772	4,276.238	4,404,404
Ex. and chgs.	13,077,681	12,619,001	13,087,763	15,984,789
Net earn. (def.)	210,141	(def.) 446,958	374.895	708,600

The decrease in gross earnings in May, 1896, was $160,-239, and in net earnings $235,599.

Chicago, Milwaukee & St. Paul.—The earnings for May are reported as follows:

	1896.	1895.	1894.
Gross earn	$2,257,920	$2,144,093	$22,259,714
Oper. exp., inc. taxes	1,586,789	1,311,304	1,534,242
Net earn	$671,131	$832,789	$725,472
P. c. exp. to earn	70⅜	61⅛	67⅞
For Eleven months:			
Gross earn	$30.076,889	$25,071,504	$28 944,009
Net earn	11,992,135	9,173.229	10,253,153

The net earnings in May, 1893, were $798,526; in 1892, $573,490; in 1891, $552,454; in 1890, $494,533.

Cincinnati Southern.—The Supreme Court of Ohio has affirmed the decision of the Common Pleas and Circuit Courts of Hamilton County in the case involving the sale of this road, holding that the contemplated sale is constitutional. The Mayor of Cincinnati will now issue his proclamation for a special city election on the question of selling the road.

Erie.—The earnings of all lines for the month of May are reported as follows:

	1896.	1895.	Inc.
Gross earn	$2,591,690	$2,512,225	$79,465
Oper. exp	1,887,011	1,818,062	68,949
Net earn	704,679	694,163	10,516

Included in the expenses of 1896 is one-twelfth of the entire taxes of the year.

Georgia Midland.—This road has recently been leased by the Southern Railway for 99 years, and that company assumed possession of the property on July 1. The road is about 100 miles long, from Columbus to McDonough, Ga. It was built some years ago as the Georgia Midland & Gulf, being intended to form a connection between Columbus and Atlanta. It was not completed, however, beyond McDonough. The old road was sold at foreclosure sale early this year and was purchased by the bondholders. It is said that under the lease taken by the Southern Railway that company is to pay the floating indebtedness of the road, its car trust and the reorganization expenses, and to pay a sum of $49,000 annually as rental.

Kansas City & Omaha.—The roads, owned by this company, from Fairfield, Neb., to Stromsburg, and also the lines running from Fairbury to McCool Junction, and the line from McCool Junction to Alma, a total of 93 miles, will be sold at public auction at York, Neb., on July 8. The sale is the result of a foreclosure and decree of the property in the Circuit Court of the United States in Omaha on March 4 last. The minimum price fixed by the court is $150,000. The company is one of the subsidiary lines of the Union Pacific.

Mexican National.—The second mortgage "A" and "B" bondholders' committee has modified the plan issued in March. The plan seeks to give some market value to 50 per cent. of the arrears of coupons on the "A" bonds; to reduce the rate of interest on the prior lien bonds and to concentrate the voting power of the existing "A" and "B" bonds, thereby retaining the control of the management. The committee is to take steps for the sale of $4,554,300 Mexican Government five per cent. bonds held by the trustees of the prior lien mortgage

National Tehuantepec.—The Mexican Government has leased this road to Messrs. Pearson & Son, of London, for 50 years. The Government contributes $150,000 per month during three years for construction work on the road, during which time the lessees obligate themselves to have the line in substantial condition. After three years the recepts af the road are to be divided between the Government and the lessees on a varying scale for each period of 10 years. The road runs between the port of Coatzacoalcos, on the Gulf of Mexico, and the port of Salina Cruz, on the Pacific Ocean.

New Orleans & Southern.—In the suit of the Central Trust Co. of New York, Judge Pardee, of the United States Circuit Court at New Orleans, has ordered the property of the railroad sold immediately. The line owns 66 miles of road along the east shore of the Mississippi River and was placed under a receivership in July, 1895. We believe that the operation of the road was suspended early this year, except the Shell Lake branch, which is now operated by another company.

Norfolk & Western.—A suit for the foreclosure of the mortgage on the Maryland & Washington Division has been brought by the Mercantile Trust Co. of New York, trustee under the mortgage. The suit is supplemental to the suit brought in February, 1895, when F. J. Kimball and Henry Fink were appointed Receivers of the Norfolk & Western. The mortgage is for $7,380,-000, executed Dec. 15, 1890, and payable Jan. 1, 1941, bearing five per cent. interest. There has been a default in the interest since Feb. 6, 1895.

Ohio Valley.—L. T. Moore, a Consulting Engineer of the Illinois Central, is now going over this road in company with several of its officers, and this inspection trip has given rise to a report that the purchase of the line is being considered by the Illinois Central management. The company operates about 130 miles of road from the Ohio River, south of Evansville, Ind. It is now being operated by John McLeod, of Louisville, as Receiver.

Pennsylvania.—The earnings for May were as follows for the lines directly operated east of Pittsburgh and Erie:

	1896.	1895.	1894.
Gross earn	$5,173,660	$5,133,566	$4,247,378
Oper. expen	3,745,161	3,604 367	2 996.290
Net earn	$1,428.499	$1,529,199	$1,251.078
P. c. expen. to earn	72⅜	70¼	69⅛
Net 5 mos	6,524,754	6,684 524	6,045.884

The lines east of Pittsburgh and Erie earned net in May, 1893, $2,200.684; in 1892, $1,665,133; in 1891, $1,718,382, and in 1890, $1,882,947.

Directly operated lines west of Pittsburgh and Erie:

		1896.		1895
Gross earn	I.	$133 900	I.	$523,566
Oper. expen	D.	33,000	I.	139.288
Net earn	I.	$167,400	I.	$384,278
Net 5 mos	I.	319,900	I.	688,083

On all the Eastern lines gross earnings decreased $19,-900 and net decreased $218,800; while on all Western lines gross earnings increased $113,600, and net decreased $180,200.

Providence & Springfield.—At a meeting of the stockholders of the company, held in Providence last week, the lease to the New England Railroad Company was ratified. This is substantially the same contract as that entered into formerly by the Providence & Springfield road and the New York, New Haven & Hartford, with the exception that this last lease bears interest at 4 per cent., payable semi-annually, and the former one at 6 per cent. It expires July 1, 1989.

St. Louis & San Francisco.—The road was sold in foreclosure proceedings, at St. Louis, on June 27. There was only one bidder, S. C. Henderson, of New York, counsel to the Reorganization Committee, who bid the purchase price fixed, namely, $1,250,000. A temporary organization of the new company has been effected. D. B. Robinson, the new President, has assumed that office, with headquarters in St. Louis.

St. Louis, Cape Girardeau & Southwestern.—The litigation for the control of this road, which has been going on in various courts in Missouri since 1893, was ended last week by the opinion filed by the Supreme Court of Missouri. Under this decision Judge Louis Houck, President of the company, retains possession of the road, although the decision is in his favor by a majority of only one in a court of seven judges. The company operates about 100 miles of road southwest of Cape Girardeau below St. Louis on the Missouri River, which has been built mainly by the efforts of Judge Houck. A bondholder alleging a default in interest secured the appointment of Ali Klotz as Receiver in 1893 by a Judge of the State Circuit Court. This receiver was afterward removed by another judge, but again reappointed. Another Circuit Court, however, appointed Mr. Houck as receiver and the Supreme Court decision now holds that the latter court properly had jurisdiction and directs that the order appointing Mr. Klotz as receiver be vacated. The management of the property has remained with Mr. Houck during all the litigation.

St. Louis, Kennett & Southern.—The United States Circuit Court has granted the motion of Louis Houck asking that the order appointing S. W. Fordyce Receiver of the road be vacated. Mr. Houck is President of the road. The suit for the appointment of a receiver was instituted by A. J. Kerfoot, a stockholder, and formerly an officer.

Electric Railroad News.

Hudson, N. Y.—The Hudson Electric Railway has passed into the hands of a receiver.

Lewiston, Me.—That part of the stock of the Lewiston & Auburn Electric Railway Co., formerly owned by N. Q. Pope and Col. F. W. Dana, of Boston, was sold on June 23 to Henry W. True, of Lewiston.

Milwaukee, Wis.—The Milwaukee & Wauwatosa Electric Railway and Light Co. has been purchased by the Milwaukee Electric Railway and Light Co., which took possession July 1. The Wauwatosa Co. has outstanding $300,000 capital stock and has a mortgage for $100,000, its line extending to Wauwatosa and including 12 miles of track operated by steam.

Scranton, Pa.—The ordinance granting the new Citizens' Street Railway Co. a franchise has been defeated by the select council.